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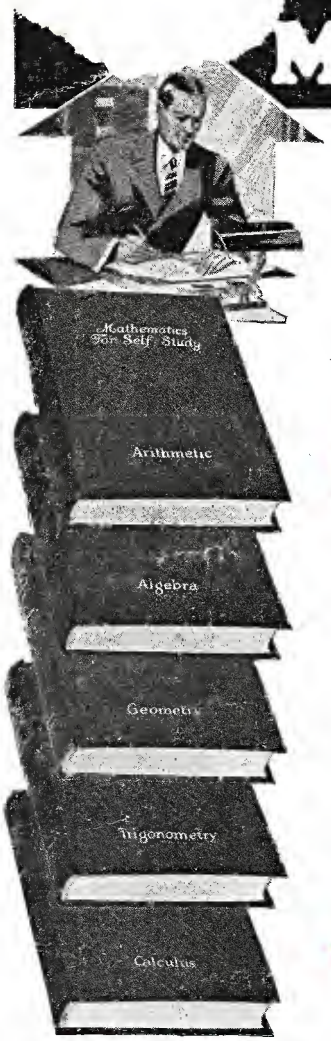

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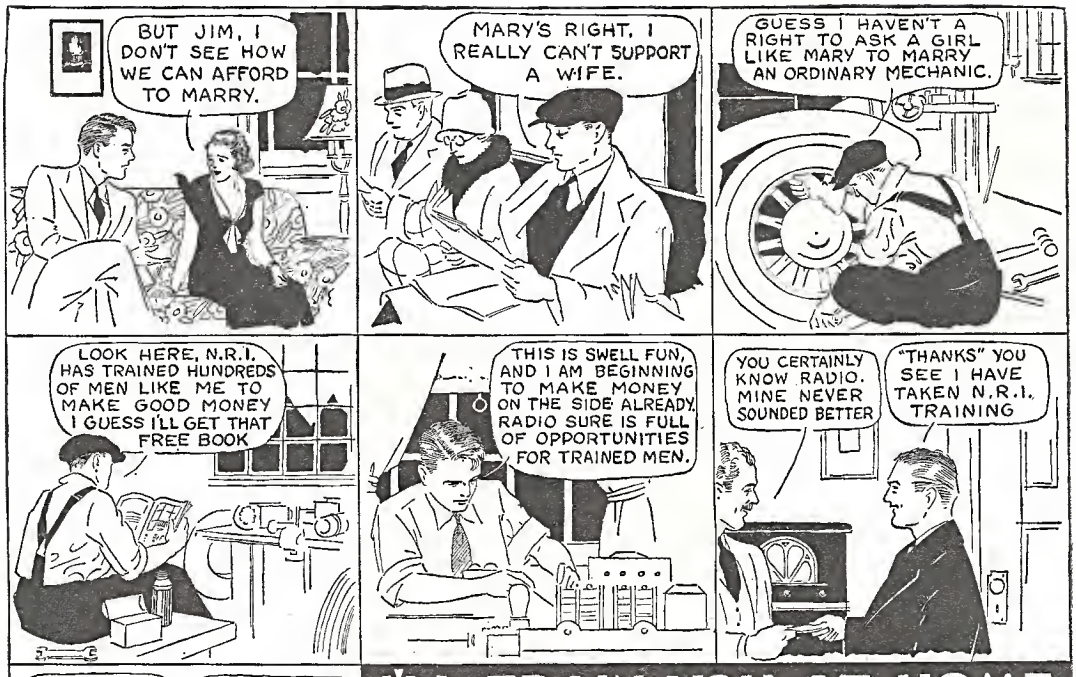
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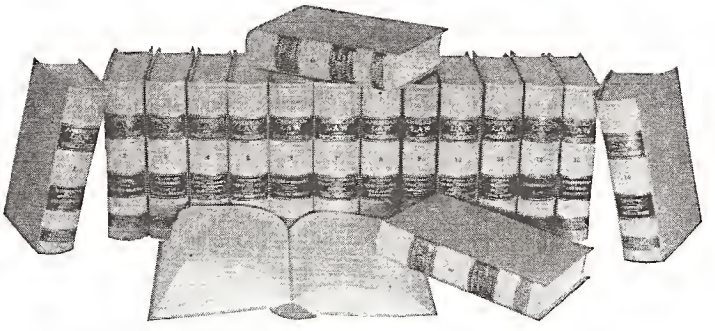

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CONTENTS

SPECIAL FEATURES

Hazards of Dynamite Plants - - - **28**
By Walter E. Stewart

Steps That Count in Good Horsemanship **32**
By Wayne Dinsmore, Secretary of Horse and Mule Association of America

Uncle Sam Harnesses Moon's Power - **36**
By Webster F. Carey

Lindy's Invention Perfects the Mechanical Man - - - - **42**
By Raymond L. Bowers

Seeking Poison Fangs of Deadly Snakes **48**
An Interview With Dr. Raymond Ditmars
By Ralph Daigh

"Chandu" Reveals His Magic Secrets - **54**
By Harold L. Zimmer

Man Will Migrate to Mars - - - - **62**
By Thomas Midgley, Vice President of Ethyl Gasoline Corporation

Thrilling Rescues of the Lighthouse Keepers - - - - - - - - **70**
By James Bowles

Catch Fish the Natural Way With Dry Flies - - - - - - - - - **76**
By Robert Page Lincoln, Hunting and Fishing Editor

Match Making—From Log to Light - - **84**
By Lieut. Don Benn Owens

Build Your Model of the S. S. Queen Mary

All eyes are turned on the S. S. *Queen Mary*, England's latest bid for supremacy of the seas. The mighty liner, now under construction, is more than 1,000 feet long and has striking lines which lend themselves beautifully to modeling. The October issue of Modern Mechanix & Inventions Magazine will contain detailed plans for building a scale model, complete, of the giant liner, S. S. *Queen Mary*.

SHORTER FEATURES

June Contest Winners - - 26
MM's Monthly Almanac - - 35
New Greyhound Bus Has Motor In Rear - - - - 41
Paragraph Oddities of Science 46
Sunken Gold Lures Robot Divers - - - - - - - 57
Microscope Shows Mechanics of Butterfly - - - - - 59
New York's Traffic Speeds on Skyway - - - - - - 61
Flying Camera Seeks News Photo Scoops - - - - 69
Side Tracking the Mighty Columbia - - - - - - 75
Needed Office Inventions - 81
Nick Sprank's Oddities of Science - - - - - - 83
300 Mile-an-Hour Zep-Plane Proposed - - - - - - 87
New Car Designs Forecast 1936 Models - - - - - 89

HOW-TO-BUILD FEATURES

It's Easy to Make Your Own Sails - - - - - - - - 92
By Julius J. Fanta
Night Stand Combines Lamp With Table - - - - - 94
By O. E. Olson
The Gas Powered Model Takes Off—Part II - - - 98
By Donald Evans
[*Continued on page 6*]

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CONTENTS—Continued from page 5

Games of Skill Enliven Beach Carnivals - 102
After Dinner Projects - - - - - - - - 106
Plaster and Paper Change Attic - - - - 108
Make These Imitation Bronze Book-Ends - 110
Watch Fish Grow In This Rustic Aquarium 112

NEW MECHANICAL INVENTIONS

Chemicals Reveal Finger Prints on Cloth 30
False Alarm Pests Have New Foe - - - 30
Built-In Jack Forms Turntable - - - - 31
Endurance Airmen Fly 59,000 Miles - - - 34
Robot Detectives Catch Police - - - - 34
Ball Wheeled Skates Are Noiseless - - - 34
Patients In Revolving Hospital Have Sunny Rooms - - - - - - - - - - - - - 39
Wood Supplies Fuel For New Car - - - 39
Robot Speeds Work Of Sorting Mail - - - 39
Youth Builds Mystery Speed Boat - - - 40
New Tailless Plane Impresses Parisians - - 45
Canvas Bag Becomes Air Pump - - - - 45
Physical Exams Now Given Cars - - - - 47
Salmon Become Prey Of Archers - - - - 47
Plane Built With Ford V-8 Engine - - - 52
Wire Connector Comes In One Piece - - 53
Electric Glove Stuns Victims - - - - - 60
Motor Unicycle Proves Fast and Safe - - 60
Astrology Goes Coin-In-The-Slot - - - 60
Meter Measures Buried Gas Tanks - - - 66
First Aid Stations Housed In Booths - - 66
Micro-Spectacles Leave Hands Free - - 66
Match Flame Powers Steam Engine - - - 66
Flashlight Plays Photo-Electric Marimba - 67
Lamp Attracts, Electrocutes Flies - - - 67
Glass Cooky Jar Becomes Diving Bell - - 68
Radio-Telephone Aids Police - - - - - 68
Spare Tire Is Rail Car Bumper - - - - 68
Giant 18 Wheel Truck Hauls 18 Tons - - 73
Trailer Device Cuts Side Sway - - - - 73
Camp Lantern Contains Compass - - - 73
Milk Bottle Taps Cream Line - - - - 74
Power Pipe Threader Is Portable - - - 74
Asbestos Clad Inventor Defies Flames - - 80
Chassis Extension Is Jack Rest - - - - 80
Robot Controls Water Turbine - - - - 80
New Method Freezes Fish Alive - - - - 80
Homemade Tri-Car Can Do 85 M. P. H. - 82
Dam Gets Own Hot Water Bottle - - - 82
Lawn Mower Has Reverse Shift - - - - 82
Camper's Stove Controls Heat - - - - 83
Floating Hospital Features Safety - - - 86
Balloons Become Freight Cars In Sky Train 88
Midget Robot Selects Programs - - - - 88
Radio-Phonograph Is Portable - - - - - 88
Autogiro Forms Screen For Floating Ads - 90
Radio Service Improves Reception - - - 90
Motorized Mower Cuts Tall Grass - - - 97
Covered Seat Rolls Over Lawn - - - - 97
Talking Ship Carries Call Through Hull - 145
Broadcasting Set Is Portable - - - - - 145

[*Continued on page 8*]

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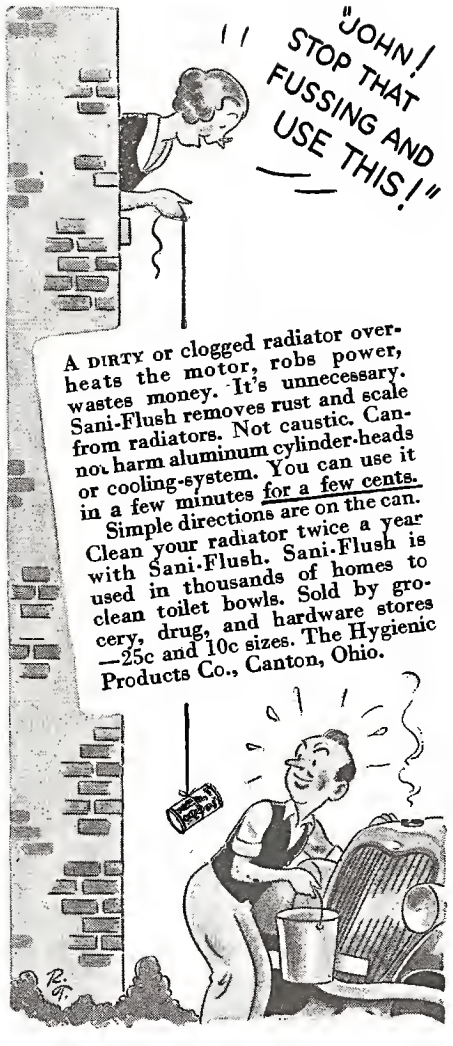

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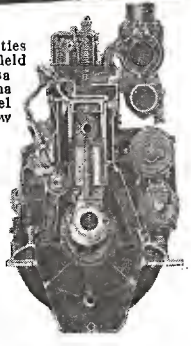

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CONTENTS—Continued from page 6

INTERESTING SCIENTIFIC ITEMS

Wheeler Dam Grows Night and Day - - 30
Hollywood Stars Become Model Fans - - 31
Largest Car Replaces King's 'Orses - - - 40
Model Locomotive Hauls Ton - - - - - 45
Dynamite Gives Niagara Falls A Face Lifting 47
Glass Blower's Magic Models Life in Drop of Water - - - - - - - - - - - - 52
"Build Your Own Yacht" Say Young Mariners - - - - - - - - - - - - 53
Cross Bred Bees Lose Bad Temper - - - 53
Traffic Lanes Interwoven On New Bridge 58
First Self Starter Now Antique - - - - 58
Most Prolific Inventor Retires - - - - - 58
Giant Belt Is Quarter-Mile Long - - - 67
French Lorry-Train Speeds Freight - - - 74
Feminine Hats Fashioned From Merchandise 86
National Television Gets Boost - - - - 88
Luxury Side Car Is Streamlined - - - - 90

FOR THE WORKSHOP FAN

Hints On Taking Care Of Your Home - - 91
Amateur Photography Tips - - - - - - - 96
Modernistic Book Shelf Fills Empty Corner 97
Radio Experimenting Kinks - - - - - - 104
Build A Public Address Amplifier - - - 105
Auto Handikinks - - - - - - - - - - 107
Fishing Secrets - - - - - - - - - - 111

DEPARTMENTS

Random Chips From the Editor's Workbench 20
Solving the Reader's Problems - - - - - 24
New Home Work Savers - - - - - - - 65
Sportsman's Campfire - - - - - - - - 73
Needed Inventions - - - - - - - - - 81
Radio Sparks - - - - - - - - - - - 103
With the Collectors - - - - - - - - - 114
Business Pays For New Ideas - - - - - - 146

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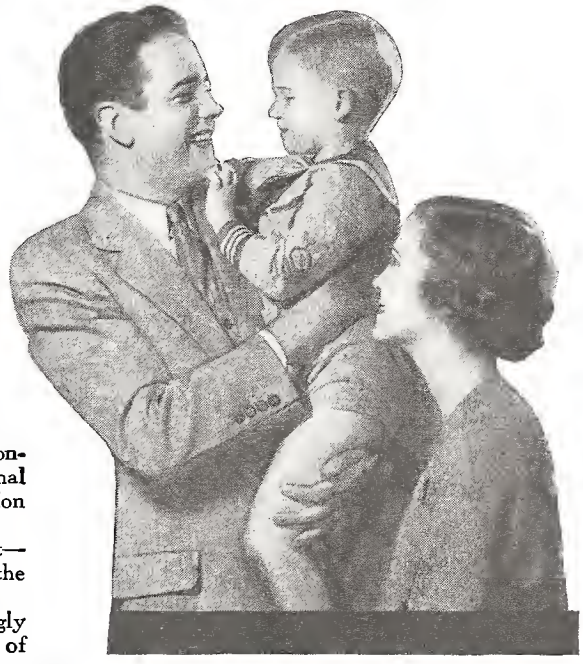

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A frank man to PATENTS-INVENTIONS

THE world of invention moves on. The Patent Office clerk who resigned his job back in 1833, because he said there was nothing left to invent, now stands out as one of the funniest men in American History. Think of everything that's happened in the last 100 years! Why, only recently the papers carried a notice that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than $15,000,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new, non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

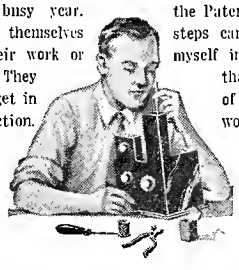
Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.



Can You Answer These Questions?

Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the *first* man to think of *my invention?* Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent, how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! YOU CAN HAVE THEM, without cost, trouble, or delay.

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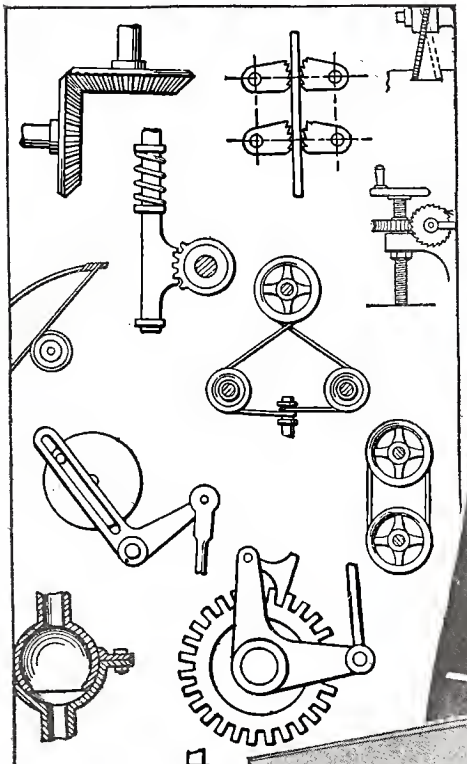

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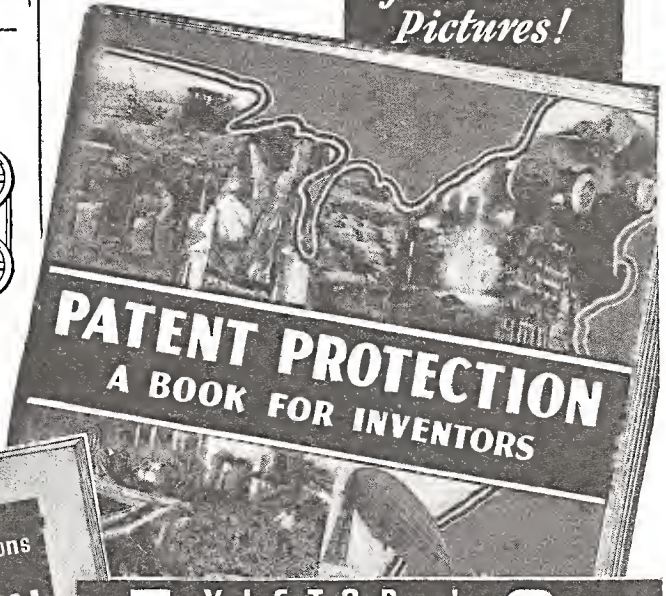

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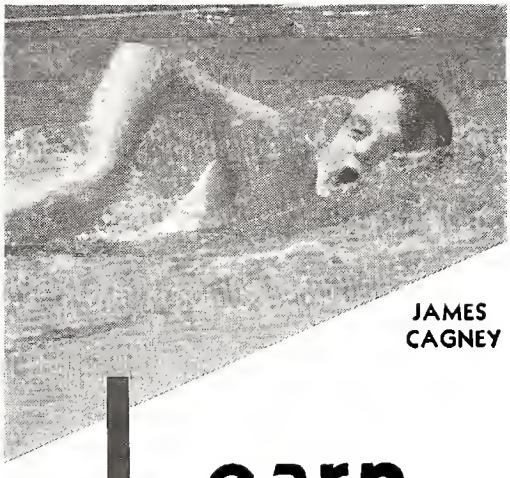

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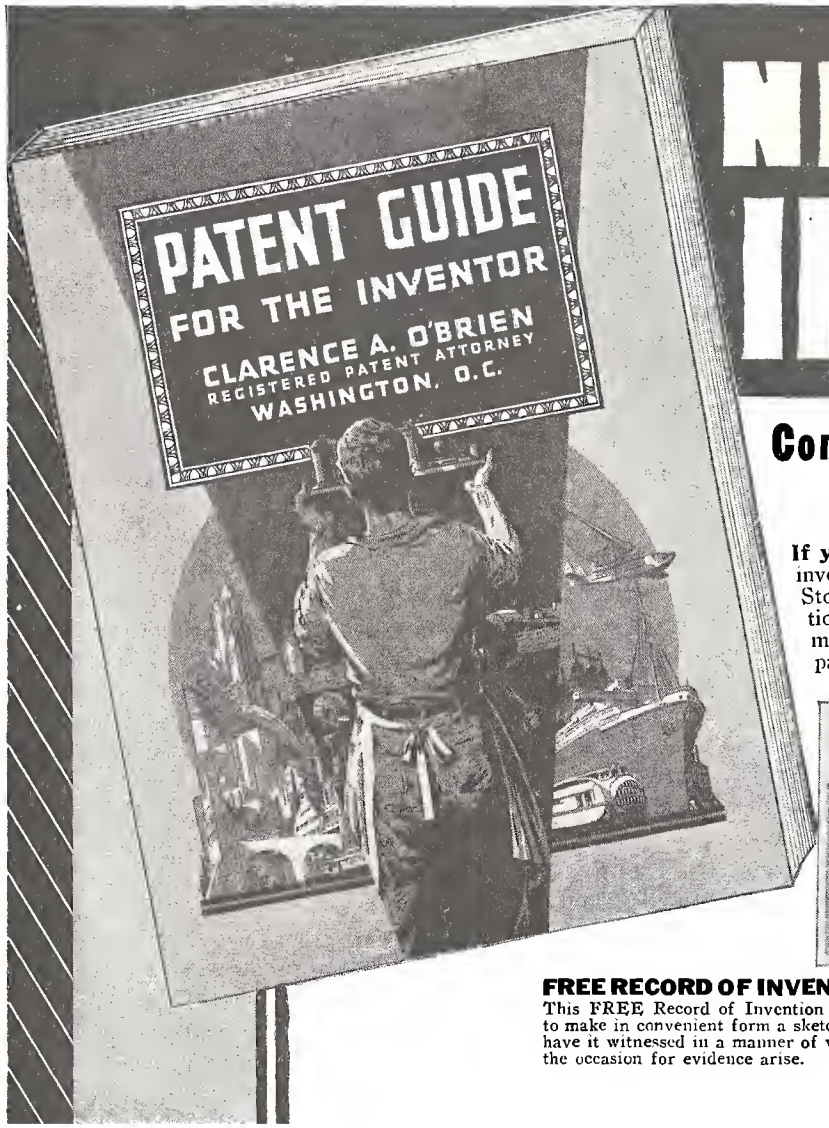

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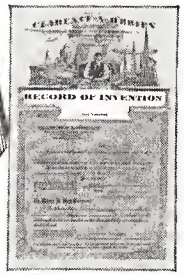

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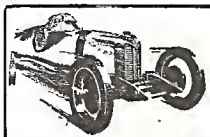

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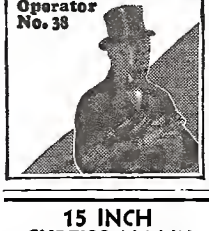

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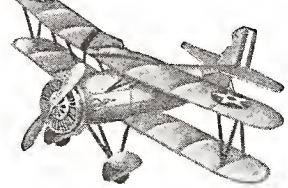

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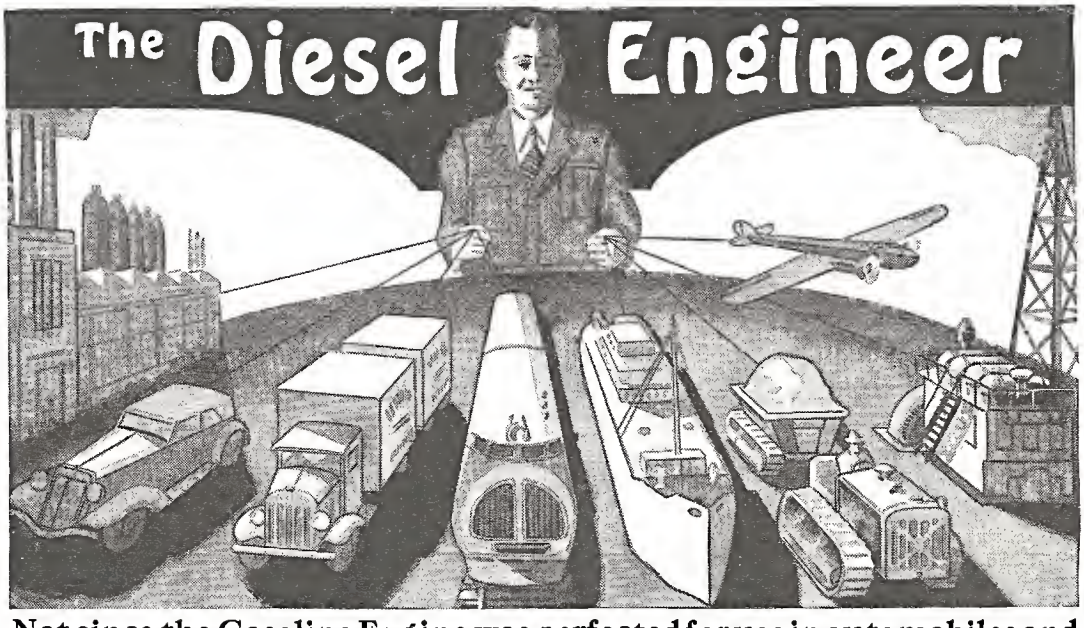

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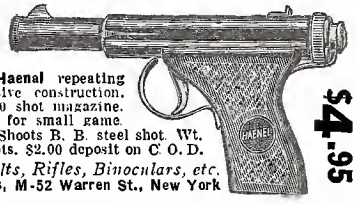

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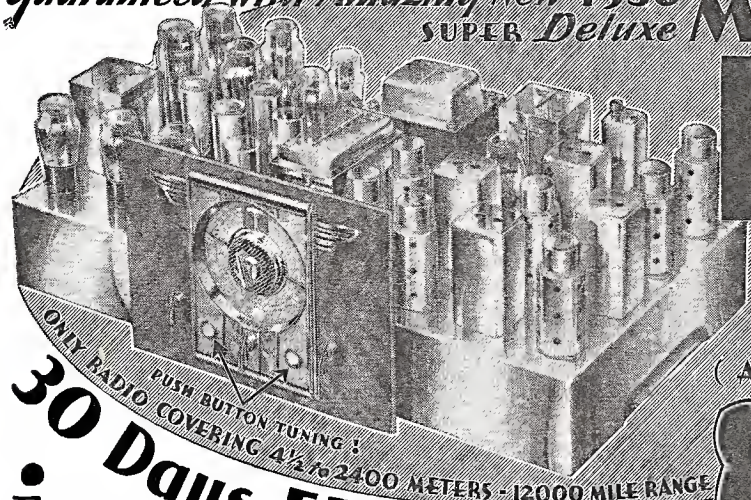

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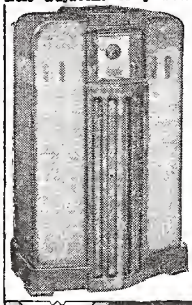

Acousti-Tone V-Spread Design (Pat. Pending) Send for FREE 40-page catalog illustrating new 1936 Midwest models and chassis in four colors. Full Scope High Fidelity Console, at left, shows dispersing vanes and exclusive V-front that propel High Fidelity waves uniformly to the ear.

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Random Chips from

A member of the Morristown Divers' club is shown emerging after an offshore dive. The club is believed to be the oldest amateur diving club. Ralston Collins' interesting letter about its activities was awarded second prize of $3.00.

MM's boy-power "steam shovel" starts a fad in Maine. One town has a shovel in every street. Builders of diving helmets organize club in New Jersey. Here's an interesting letter about their underwater activities.

WE CONSIDERED Ralph Moore's "Boy-Power Steam Shovel" in the April issue an attractive project for the youngsters, but it was beyond our dreams to see that steam shovel become a fad.

It actually did in East Millinocket, Maine, where there's a boy-power shovel in every street. The Rev. Charles A. Watkins of the Congregational Church there sent us an interesting layout of photos of 25 shovels and the boys who built them. The photos and the following letter were awarded first prize of $5.00 in this month's Workbench contest:

East Millinocket.

Dear Editor:

These youngsters make up the smaller boys' group of the Congregational Church at East Millinocket. The pictures speak for themselves.

I saw the idea in the April MM, adapted it to this age group, and the boys made twenty-five "steam shovels." I drew the plans, cut the templates and the boys sawed the lumber. Together we had a great time building our steam shovels.

Now there is a "steam shovel" on every street of our town. Thank you for your fine ideas.

Rev. Charles A. Watkins.

The boys appear to be quite proud of their shovels, but not more so than we are. We hope they will continue to build other models and toys appearing in MM.

***

Rev. Watkins' letter is interesting, but we received an equally interesting epistle from Ralston Collins on stationery of the Morristown Divers' Club, of Morristown, N. J. As a matter of fact, we debated for some time over the problem of which letter should receive first prize. We finally succumbed to the evidence of quantity production of an MM project in the letter and photos from Maine. Consequently second prize of $3.00 was given to this letter:

15 Hazel Street,
Morristown, N. J.

Dear Editor:

Well, well, well, as the walrus said, "the time has come!" and after years of procrastination I at last take pen in hand and drop a line to good old MM.

Way back in 1929 when yours truly was a mere high school boy, he conceived the idea of making a home-made diving helmet, which was no sooner said than done. While I don't, by any means, claim to be the first person to build a home-made helmet, I believe mine was built before any magazine ever printed articles or plans on such an animal.

Anyway, the gang does believe that our club is the oldest amateur diving club in existence

the Editor's Workbench

(formed June 11, 1931) and I wish that you would try to verify or explode this theory.

After making more than a dozen helmets out of everything from soup to nuts, we finally hit on the idea of using a milk can for the basic element. It is the best yet by far, because it is light, strong, can be easily worked, and above all, it can be soldered.

Not wanting to make this missive too lengthy, I'm going to state briefly some of our club's feats and accomplishments. We have documentary evidence to prove any of these statements.

1. Aided in much rescue work in the vicinity, actually retrieving one body.
2. Two members reached a depth of sixty feet in our helmets at Lake Hopatcong, N. J.
3. Installed a new aeriating spray in the municipal reservoir, saving the town the trouble and expense of draining.
4. First used two-way telephone system in helmets in early 1931. We believe this was the first time telephones were successfully used in this type helmet.
5. Gave first description of a dive from underwater over a microphone and public address system at a local aquatic meet in August, 1932.

There are many other things which our club pioneered in, too numerous to mention here, but among which are successful underwater photography and experimental submarine ballistics.

Above—Some of the 25 boys of the Congregational Church in East Millinocket, Me., who built MM's boy-power "steam shovel." Below—Closeup of some of the shovels. Rev. Watkins cleverly redesigned the original to dispense with the wheels. His letter and photos won first prize of $5.00.

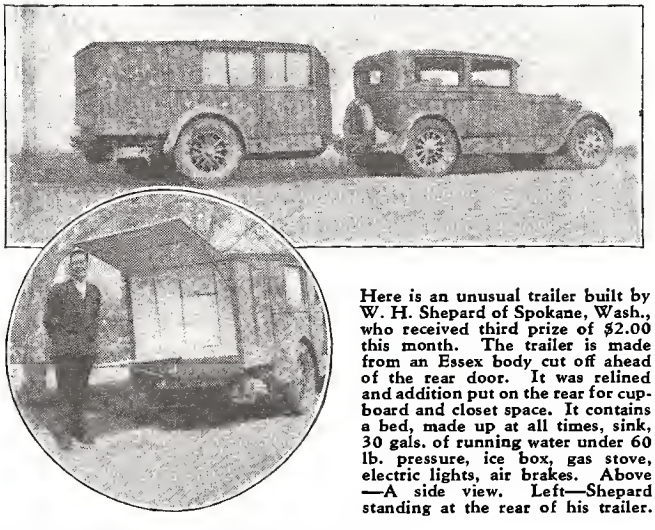
The club has a colored lantern slide lecture of its history and exploits, which has been given in the local schools and before various other clubs and organizations. We also have our own motor boat, bought with club funds, on one of the nearby lakes.

Among the events scheduled for this year are: 1. An attempt at a new depth record of at least 75 feet; 2. An underwater broadcast on five meters; 3. A try at underwater color photography.

Ralston B. DeG. Collins.

Collins adds that he will gladly answer questions from readers on underwater subjects. His address is given above and don't forget that stamped return envelope. His letter was so interesting to us, we could not resist quoting practically all of it. Now, if any of you amateur divers dispute his claims, let's hear from you.

[*Continued on page 22*]



Here is an unusual trailer built by W. H. Shepard of Spokane, Wash., who received third prize of $2.00 this month. The trailer is made from an Essex body cut off ahead of the rear door. It was relined and addition put on the rear for cupboard and closet space. It contains a bed, made up at all times, sink, 30 gals. of running water under 60 lb. pressure, ice box, gas stove, electric lights, air brakes. Above —A side view. Left—Shepard standing at the rear of his trailer.

10" WOOD-WORKING LATHE

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36" Between Centers
100 Lb. Weight

$21.75 Less Motor

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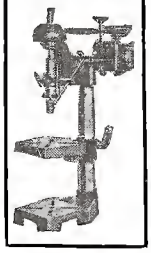

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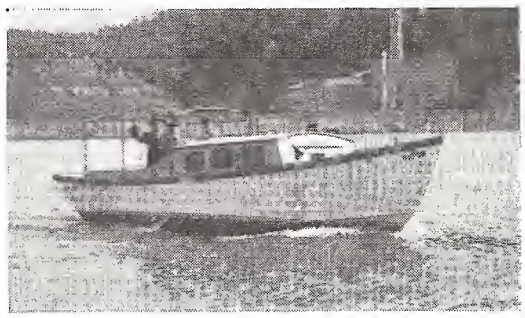
Chips from the Editor's Workbench

[*Continued from page* 21]



Here is MM's *Dorothy*, first boat built by L. Enie, who praises John G. Hanna's plans. Enie plans to rig her with sails.

For his first boat Leo Enie decided to build MM's 24-foot cruiser *Dorothy*. The photograph, reproduced in this department, attests to the excellence of his workmanship. Here is his letter:

Etna, Pa.

Dear Editor:

I am sending a picture of one of the boats designed by John G. Hanna in MM. This is the first boat I ever built. I did the job alone from stem to stern.

I have powered it with a Star 4 Motor. I will put sails on her later. She looks like a real he-man boat and acts like one.

Leo Enie.

***

Austin York of Carlton, Ore., is another loyal booster of MM. He sent us photos of a garden tractor which he built stating "I started reading MM in 1928 and have every copy since then." Since he does not name his first issue, we are not sure whether he has a better record than Sheldon A. Vaughn of Medical Lake, Wash., who has every issue since No. 7 of Vol. I.

***

A few short notes before we close: Johnny McManus, who is only 11 years old, tells us he drives a hydroplane on a lake at Danbury, Conn., and is not afraid to run her with the throttle wide open. The hydroplane was built by C. Frank of Carmel, N. Y., where Johnny lives.

William Zeiss, of 3826 S. Broadway, Los Angeles, would like to hear from MM boating fans.

K. Spence, 81 Orchard Road, Chatswood, N. S. W., Australia, wants to swap news and views with MM readers around 21 years of age.

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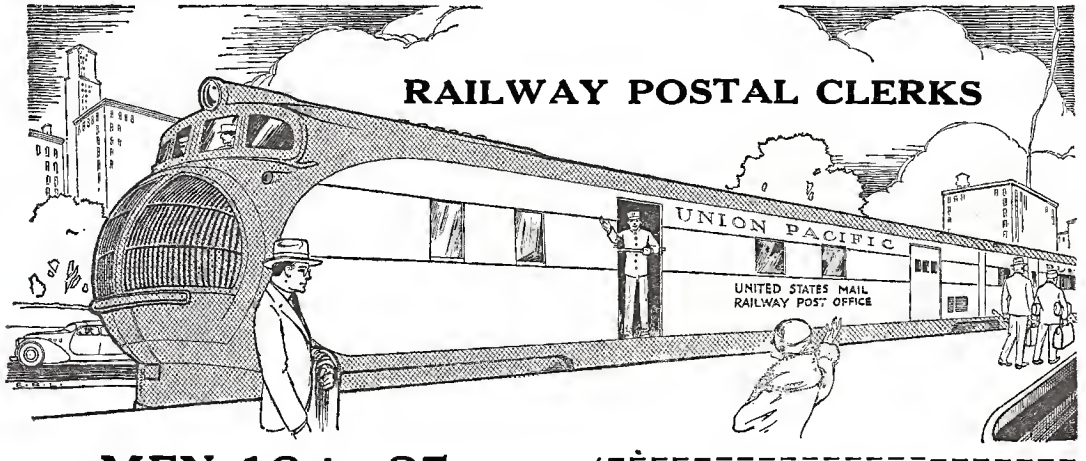
Name .....
Address .....
Instrument .....

TRAVEL FOR "UNCLE SAM"



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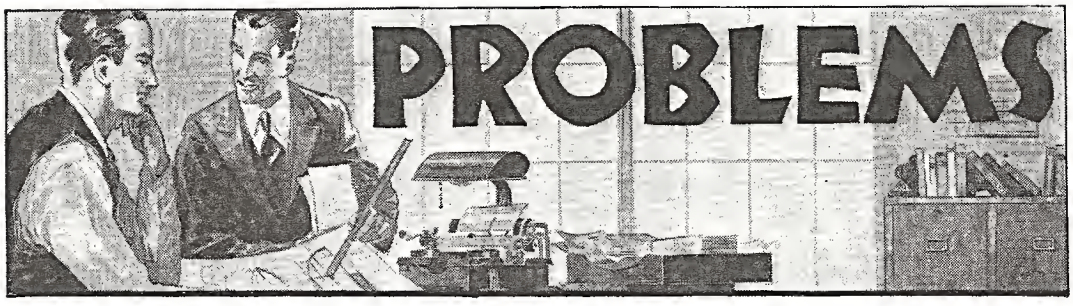


Here are the answers of MM experts to interesting reader questions.

HOMEMADE ACETYLENE WELDERS

What precautions should be observed in using homemade acetylene generators for welding, to eliminate the fire hazard?—C. J., Madison, Wisc.

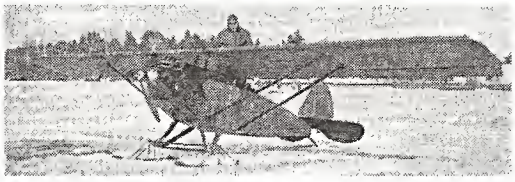
Excessive pressure of acetylene gas and the possibility of a flash-back are two hazards which might cause a serious explosion in any acetylene welding unit. Underwriters' Laboratories Standards prescribe a flash-back check, a valve located between the gas generating chamber and the torch, to prevent flame at the torch from moving back into the tank.

An automatic relief valve on the tank, set to open at a pressure of 15 lb. per sq. in., is necessary; at higher pressures acetylene gas tends to break up, liberate a great deal of heat, and become self-explosive.

Copper in contact with acetylene forms a very explosive gas; for this reason no copper should be used inside the gas generating chamber or at the welding torch.

FLOATS FOR A LIGHT PLANE

I have an "oversize" Russell monoplane equipped with skis, which can now be used only in winter months, because there are no safe landing fields up here. I have a 4-cylinder, 27 h.p. engine, giving the ship a top speed of 75 m.p.h. Will this ship take off the water with the Heath floats, plans for which appear in the 1931 Flying Manual?—E. J. R., Callander, Ontario, Canada.



From the shores of Lake Nipissing, Ontario, comes a letter asking if this monoplane could be equipped with pontoons.

The data furnished in your letter indicates that your ship would just be on the ragged edge of taking off against a ten-mile breeze, with these pontoons. If you are willing to take a chance for the fun of experiment, you can enlarge the Heath floats by multiplying all dimensions of the shape by 1.125. The structural sizes may stay the same.

STARTLING STAMP STATISTICS

Has the government issued any book describing all issues of United States Stamps?—B. O. L., Omaha, Nebr.

For one dime you can obtain from the Superintendent of Documents, Washington, D. C., a 66-page booklet called "A Description of United States Postage Stamps," which contains interesting data on every stamp issued from 1847 to 1935. The first day of issue, a description of the design on each stamp, the story back of the design, and in many cases the number of stamps printed, are given. (Remit either by coin or money order—the government does not accept stamps.)

ROPE-WALKING DOGS

How can a dog be taught to walk on a tight wire?—L. E., Marlin, Texas. Can a dog be taught to jump rope?—R. W., Notus, Idaho.

In teaching a dog to walk on a tight wire, start him on a 4″ wide plank raised a few inches above ground. Gradually increase the height, and reduce the size of the board, while leading the dog across on a leash. Next use a large size rope, and finally the wire. Provide a net beneath, or keep close to the dog to catch him in case of a fall. Repetition and patience are required, but when thoroughly mastered it is a pleasing trick to watch.

An assistant is required in teaching a dog to jump rope. Tie one end of the rope to a tree, having the assistant hold the other. Command the dog to "Jump" and pull on his short leash rather severely as the rope swings over you and strikes the dog's legs. As soon

[*Continued on page* 26]

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PRECISION BENCH LATHE
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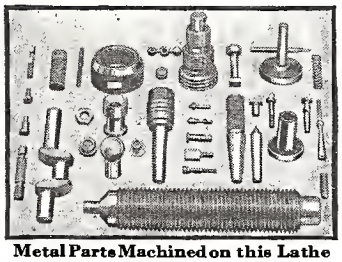

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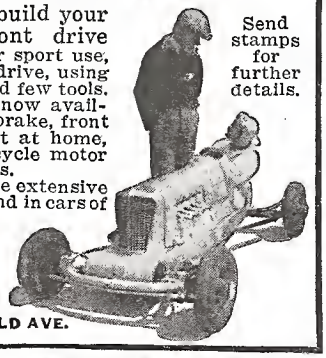

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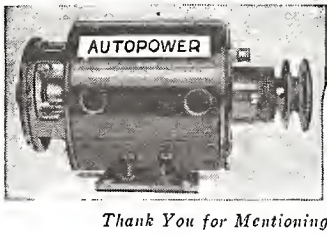

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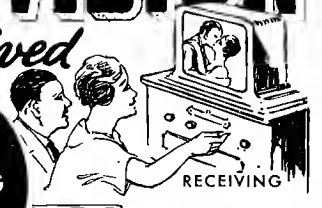

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Problems Editor Answers Queries

[*Continued from page* 24]

as the dog learns to jump with you, it will be easy to teach him to jump alone.

STRATOSPHERE GONDOLA COLORS

Why are the gondolas of stratosphere balloons black on the lower half, white at the top?—M. R., Austin, Minn.

The upper half of the gondola is finished with a paint which reflects the heat from the sun. Since no material is a perfect reflector, considerable heat comes through, and would make the interior unbearably hot unless the heat could be radiated out again through the blackened portion. The temperature inside the gondola may be controlled by varying the black area, perhaps by pulling black shades over portions of the silvered part.

ARTIFICIAL WATER

I am building a miniature waterfalls. Can you suggest something which will give the effect of water over the falls, yet be dry? White sand does not run freely enough for my purpose.—E. J., Buffalo, N. Y.

Small round glass beads may be used in place of water, and will give a sparkling effect if illuminated from behind the falls. The beads can be elevated to the top of the falls again by an arrangement of tiny conveyor belts driven by a small electric motor.

June Puzzle Contest Winners

TO MARGARET DUNFORD, a student at Wayne University, Detroit, Mich., goes the first prize of ten dollars. E. F. Kirtland, Beaver, Pa. wins $5 as second prize. Third prize winners, receiving $1 each, are: E. B. Escott, Oak Park, Ill.; Irving Goldfien, Milwaukee, Wis.; Norman Wickstrand, Meriden, Conn.; Paul Neussendorfer, Melrose, Minn.; E. I. Stearns, Somerville, N. J.; L. L. Davis, Kansas City, Mo.; George Demers, Akron, Ohio; Harry Wenzel, Van Dyke, Wis.; A. G. Bonilla, Santurce, Puerto Rico, and Roy Johnston, Sioux City, Iowa.

These fifteen fourth prize winners receive the blueprints they specified on their entries: H. G. Gordan, Garden City, N. Y.; Fremont Crane, Spokane, Wash.; I. Keyfitz, Montreal, Quebec; M. B. Clark, Knox, Pa.; Wm. F. Blum, Philadelphia, Pa.; Floyd Mason, Challis, Idaho; Carroll M. Hanson, Bottineau, N. Dak.; Mark Wise, Tippecanoe City, Ohio; R. K. Nedrud, Minot, N. Dak.; H. Judefind, Claymont, Del.; A. L. Demers, San Fernando, Cal.; Marten Van Gordan, Cleveland, Ohio; Elmer L. Hagedorn, Ray Village, Ohio; Melvin Densmore, Eldred, Pa.; C. Wease, Adena, Ohio.

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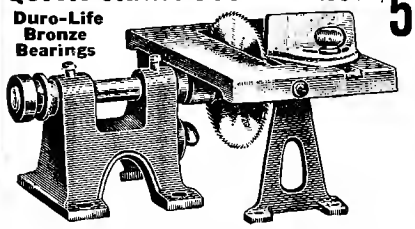

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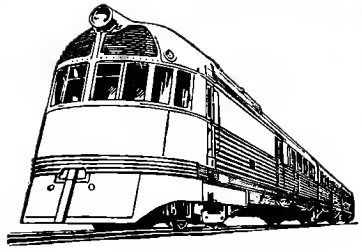

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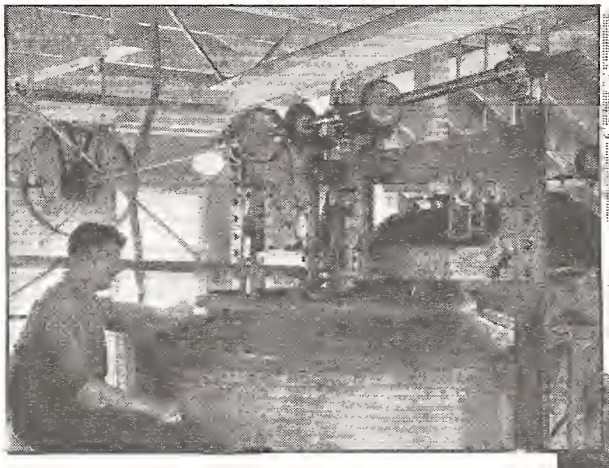
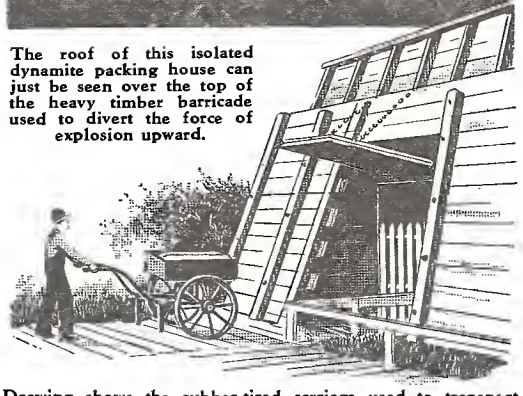
Hazards of DYNAMITE

A story of the dynamite makers—brave men who mix "soup" and "dope" behind "DANGER —HIGH EXPLOSIVES" signs.



In this tank acids combine with glycerin to form nitroglycerin. The operator must watch the liquid constantly, ready to open a valve and admit water at signs of danger, or to operate a lever which dumps entire tankful into a huge cistern of water.

The roof of this isolated dynamite packing house can just be seen over the top of the heavy timber barricade used to divert the force of explosion upward.



Drawing shows the rubber-tired carriage used to transport tanks of nitroglycerin from storage vat to the mixing house. Dynamite house doors always swing outward for instant exit.

DESPITE the fact that makers of dynamite observe more safety precautions than do men in any other industry, dynamite making is still one of the world's dangerous enterprises. Carelessness, haste, or negligence bring sudden, shattering death, as concentrated explosives release pent-up energies, toss buildings and machinery skyward.

On June thirteenth of this year, some explosives maker in the little town of Reinsdorf, Germany, erred. A series of shattering explosions at the Westfalian Anhalt Explosive Works rained blackened debris over the countryside, destroying the town, killing and injuring thousands of workers.

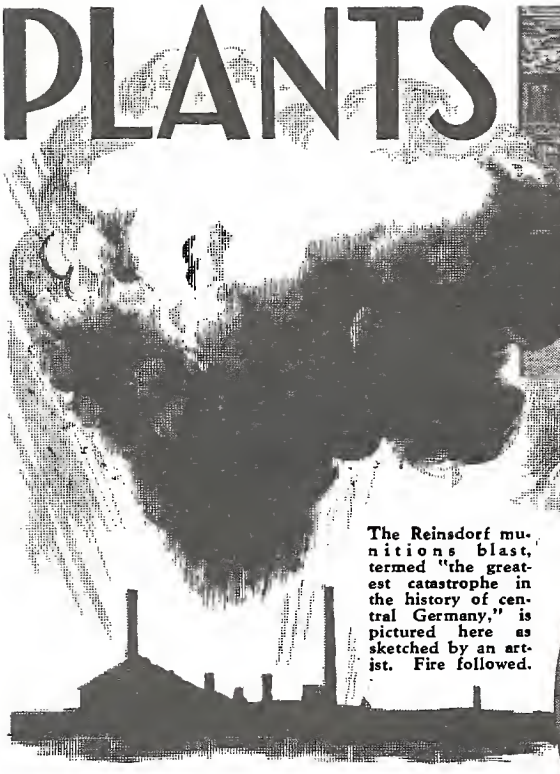
The isolation of dynamite plants from big cities is a subtle warning of the death that lurks in every sizzling chemical vat.

One comes upon a tall wire fence, surmounted by several strands of barbed wire. A glaring sign on the large gate is enough to turn back the casual visitor. It reads, in expressive red letters, "DANGER, HIGH EXPLOSIVES." Inside the fence is a no-man's-land of wooded terrain, well cleared of inflammable underbrush. Upon passing this one comes upon, apparently, a series of well-separated fortifications of the rectangular block house type. Some of these have for walls earth embankments twelve feet thick at the base, three feet wide at the top, and

OTHER MUNITIONS EXPLOSIONS

1934—150 killed in dynamite explosion which destroyed the greater part of La Libertad, El Salvador.
1933—Several killed, many seriously injured in explosions in bomb storehouses and powder magazines at Hamamatsu airbase in Japan.
1931—Forty-five killed by blast in torpedo loading plant at Rio de Janeiro, Brazil.
1926—Many killed in explosion of naval arsenal at Lake Denmark, New Jersey.
1924—Nearly thirty killed when TNT exploded at Nixon Nitrate plant, N. J.
1918—Twelve killed in explosion at E. I. du Pont de Nemours powder works, Pompton Lakes, N. J.
1918—One hundred killed at TNT plant, Aetna Chemical Co., near Pittsburgh, Pa.
1917—Two killed by blast at Haskel, N. J., powder works of du Pont.
1916—Four killed at Black Tom powder plant, N. J.

PLANTS



The Reinsdorf munitions blast, termed "the greatest catastrophe in the history of central Germany," is pictured here as sketched by an artist. Fire followed.

Here, in a partially demolished house near the German munition plant at Reinsdorf, men are searching for the bodies of blast victims. Official reports say more than fifty were killed.

TNT exploded at Nixon Nitrate plant in New Jersey, 1924, leaving this ruin and chaos.

by **WALTER E. STEWART**

towering to the height of a two-story building. Others, apparently of more recent design, have heavy concrete retaining walls with earth in between, or log cribworks filled with earth.

In a huge tank in one of these houses is stored several thousand pounds of that most powerful explosive, nitroglycerin. This single tank contains enough deadly power to blast 96,000,000 pounds of solid rock from quarry or mountainside.

In two other embanked buildings are large, frictionless mixing machines which compound the nitroglycerin or "soup" with "dope" to make dynamite or one of the many types of explosive powder. Other buildings are steam heated drying houses, storage bins, packaging houses, and shipping rooms.

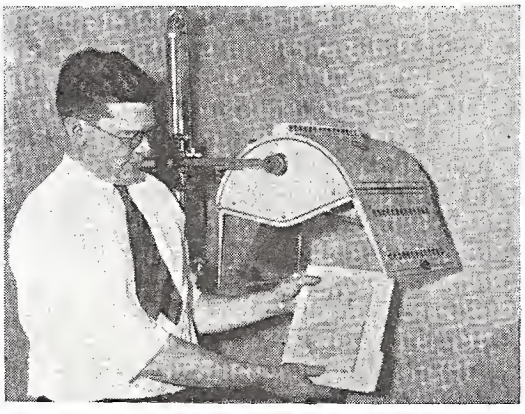
Each operation is conducted in a separate building, and usually no more than three men are permitted to work together in one of them. The buildings are lightly constructed so that they will easily give way to an explosion. The heavy outer bulwarks then divert the force upward, preventing an explosion in one house from spreading to others.

Friction is the most deadly foe of explosive workers. A tiny bit of sand or metal in a mixer means almost certain death for the two workers and destruction for the expensive machinery and buildings. The result may be the same if a man carelessly slides one drying pan over another, or if in moving about he drags his feet over the dry powder

This new explosive, known as Nitramon, is immune to flames, and can be detonated only by a large charge of dynamite. Large supplies of Nitramon can be stored in safety, where ordinary stick dynamite or TNT would prove too hazardous.

[*Continued on page* 142]

Crime-Fighting Chemicals Reveal Fingerprints On Cloth



Another weapon in the unceasing war against crime is a chemical solution which makes fingerprints on clothes or fabrics visible under ultra-violet light. Dr. E. M. Hudson, the inventor, shows a print taken from a handkerchief.

SCIENCE has once more dealt a devastating blow at crimedom, this time through the perfection of a process whereby fingerprints left on cloth, paper and other soft materials can be perfectly reproduced for evidence.

The process, invented by Dr. E. M. Hudson, is hailed by G-men and police as one of the greatest advancements in criminal apprehension since the discovery of unsimilarity in fingerprints. Silver nitrate is the principal ingredient in the process. Materials bearing prints are treated with the preparation, pressed through a wringer, and then submitted to the rays of a sun lamp.

Wheeler Dam Grows Night and Day

NIGHT and day construction work on the Wheeler Dam across the Tennessee River 15 miles above Muscle Shoals continues as engineers adapt heroic measures to have the giant task completed in 1936.

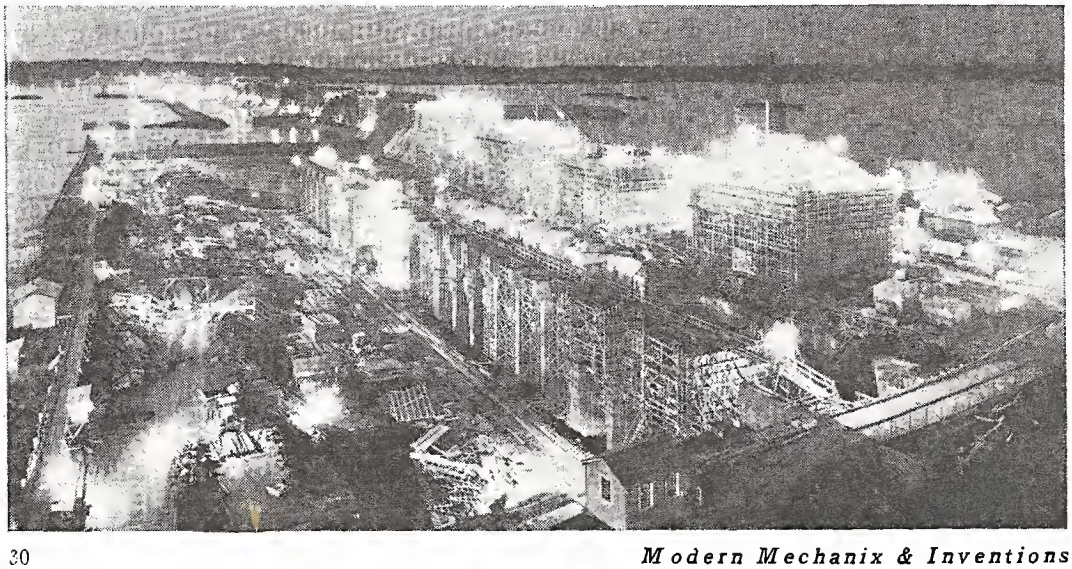
The dam, which is being built by the TVA, will be 6,000 feet long and 62 feet high, and will aid navigation by forming a lake 89 miles long. Power will be supplied to several states through an integrated system in which the power from Wheeler Dam will be coordinated with that of the three other dams comprising the project.

At night the dam is brightly lighted from power supplied by the completed Wilson Dam.

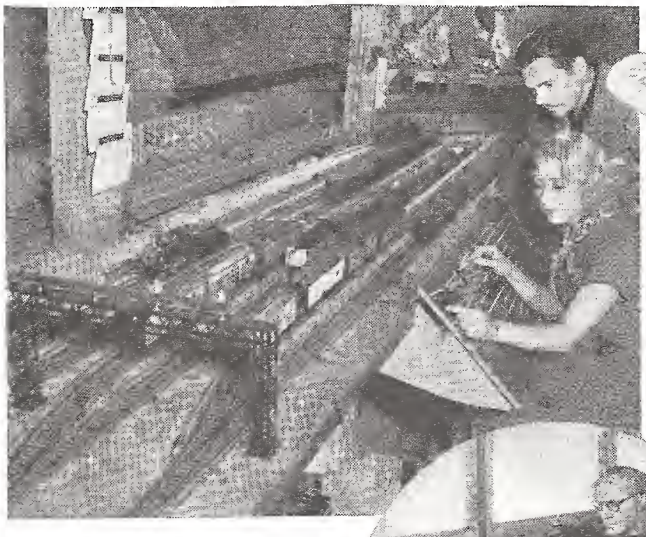
False Alarm Pests Have New Foe

FALSE alarms, which annually cost cities thousands of dollars, are greatly reduced by the use of a new alarm box which sounds a loud signal when the handle is pulled. Attention is immediately attracted to the box, and anyone ringing a false alarm would be identified by passing persons.

The siren at top of this fire alarm box sounds for one minute when handle is pulled, to discourage vandals from ringing false alarms.



Hollywood Stars Become Model Fans



Above—Joan Blondell and her husband, George Barnes, find their elaborate miniature railroad system an excellent means of relaxation. Joan is shown at the control board guiding a through freight through the yards, while her husband directs from the sidelines. Circle—Director Lloyd Bacon is another of Hollywood's miniature railroad addicts, his enormous system being located in one of the chicken houses on his ranch. Photo shows him racing two of his fully equipped freight trains.

The dangers and expense of filming mid-air plane crashes led Reginald Denny to design and build the model plane with which he is shown above. It has a wing spread of 71 inches and a 1/5 h.p. motor. Two such models can be adjusted to crash several hundred feet in the air, saving thousands of dollars.

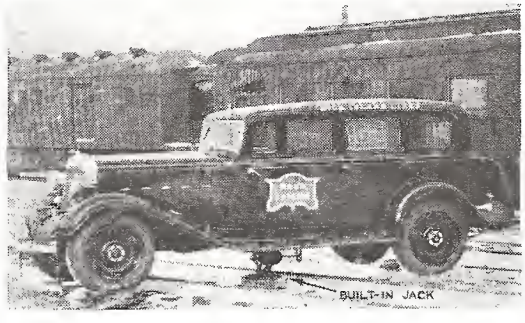
THE fascination of models that work—miniature railroad systems, airplanes, steam boats—is something that cannot be resisted by the smallest boys, the tired business men, or the biggest movie stars in Hollywood.

The latest working model enthusiasm to sweep the movie capital is the miniature railroad, long a recognized sport of Eastern business magnates. Among the most devoted followers are Joan Blondell, screen star, George Barnes, her husband, and Director Lloyd Bacon.

The B and B System (Barnes and Blondell) is recognized as one of the finest. It is equipped with an elaborate dispatcher's board, freight transfer, through passenger lines, depot, and a complicated system of signals. Realistic mountains and prairies form the scenery.

Reginald Denny is the ace of airplane model builders, one of his larger models having a 71-inch wing span and a ⅕ h.p. motor. It can be set to fly several hundred feet up.

Built-In Jack Forms Turntable



This built-in jack, mounted directly under the center of gravity, serves as a convenient turntable for this rail car. It is the only type of jack which can lift the entire car at once.

MOUNTED directly under the center of gravity of an automobile, a new built-in jack serves to lift the entire car, either for repairs or for turning, as on a turntable, in cramped quarters.

The jack is raised or lowered by means of a hand crank under the running board.

Steps That Count

by
WAYNE DINSMORE
Secretary,
Horse and Mule Association
of America

In no sport is perfect cooperation between man and horse more essential than in polo. In this photo, Spencer Tracy, movie star, times his shot by the stride of his polo pony.

THE HE beauty and daring of good horsemanship belong to the ages. Figuratively, the man in the saddle is a superman. In no other sport do we find a more variable technique than that required of the skilled horseman; from the rough-riding bronco buster to the rider of sleek show and saddle horses.

In short, it is a sport that makes a premium of perfect co-ordination of mind and muscle, grace and poise and a psychological knowledge of the horse.

Almost everyone has either attended a horse show to marvel at the sheer beauty of the saddle horse or has stood in amazement as some fine horse would pass on the bridle path. But few know that technique of riding well and the distinction between the gaits of horses.

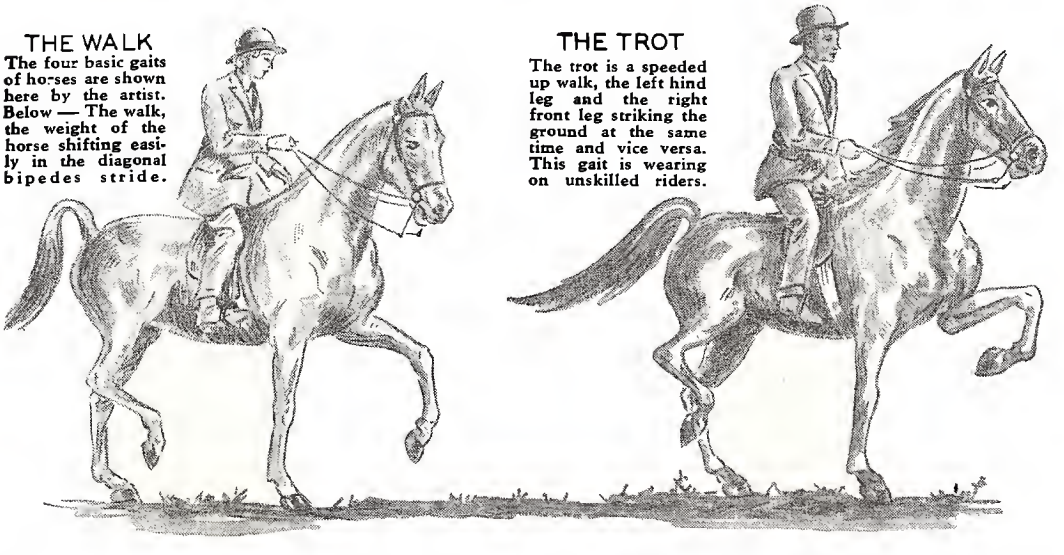
Three gaits come naturally to every horse—namely, the walk, trot and canter. But to this trio must be added the rack, commonly called the single-foot, to complete the list of basic gaits. There are other gaits, but in every case they are variations of one or the other of the basic gaits.

THE WALK

The four basic gaits of horses are shown here by the artist. Below — The walk, the weight of the horse shifting easily in the diagonal bipedes stride.

THE TROT

The trot is a speeded up walk, the left hind leg and the right front leg striking the ground at the same time and vice versa. This gait is wearing on unskilled riders.



in GOOD HORSEMANSHIP

Horse shows at the fairs this fall will be appreciated more than ever when one understands what is taking place in the arena. In this article, one of America's foremost authorities on riding horses gives inside facts on good horsemanship.

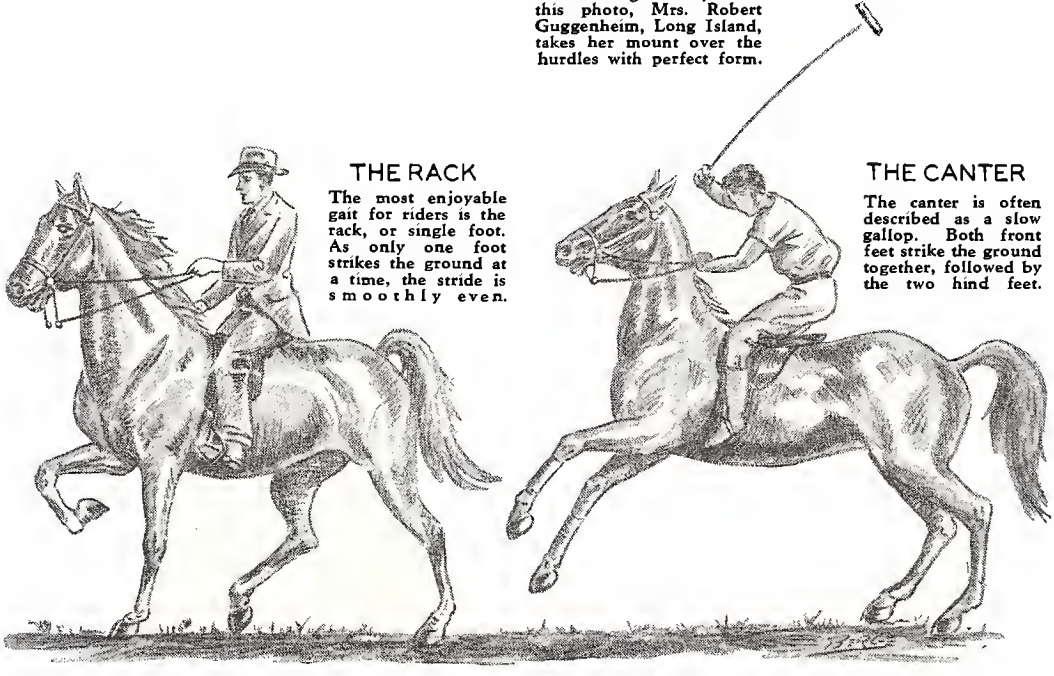
The walk is a 4 beat gait, as each foot strikes the ground separately. It is diagonal in nature. The right front strikes the ground, then the left hind, then the left front, then the right hind, after which the series starts over. There are always two points of support resting on the ground.

The trot is a 2 beat diagonal gait, in which the right fore and left hind take off, and strike simultaneously. The opposite diagonals take off as the first set are striking the ground, although in the fast trot there is an interval when all four feet are off the ground.

The canter is a 3 beat gait of diagonal nature, as in one lead the right front and left hind strike at the same instant, whereas the left front and right hind take off and strike, not simultaneously but at different intervals. There is a perceptible period in which all legs are off the ground, folded beneath the body, as the hind legs are being carried forward,

[*Continued on page* 140]

A thorough knowledge of the gaits of horses is necessary before jumps can be made gracefully. In this photo, Mrs. Robert Guggenheim, Long Island, takes her mount over the hurdles with perfect form.



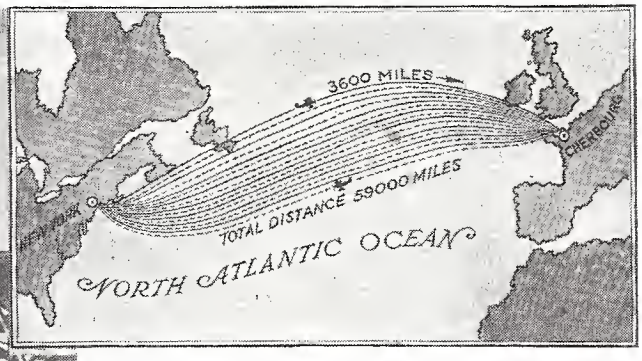
THE RACK

The most enjoyable gait for riders is the rack, or single foot. As only one foot strikes the ground at a time, the stride is smoothly even.

THE CANTER

The canter is often described as a slow gallop. Both front feet strike the ground together, followed by the two hind feet.

Endurance Airmen Fly 59,000 Miles to Set 653-Hour Record



Left above—The powerful monoplane, Ole Miss, flown by the Key brothers in setting their world endurance flight record of 653 hours, is shown as the brothers circled the landing field at Meridian, Miss., preparatory to contacting the refueling plane. Below—The two Key brothers, Fred, left, and Al as they posed before their plane before taking off on their flight. They are leaning against the catwalk by which the motor was reached for minor adjustments. Above—Had the youths flown between Cherbourg and New York, instead of over Meredian, they would have crossed the Atlantic 16 times.

CIRCLING above Meridian, Miss., for 27 days, 5 hours and 34 minutes, the "Flying Key Brothers," Fred and Al, shattered all endurance flying records, both official and unofficial, in their powerful monoplane, "Ole Miss."

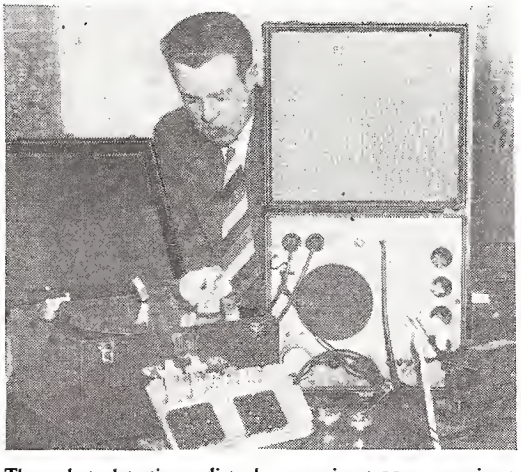
The total distance flown by the brothers during their sojourn in the sky was 59,000 miles, the equivalent of 16 Trans-Atlantic flights, or more than twice around the globe at the equator. The motor of the plane was functioning perfectly as the daring youths made a flawless three-point landing at the end of their epoch making flight.

All minor repairs to the engine were made while in flight, the brothers reaching the motor by means of a slender cat walk.

Robot Detectives Catch Police

POLICE in St. Paul, Minn., long trained to apply science in the detection of evidence, failed to detect, recently that their own scientific devices were being used against them in obtaining evidence of a link between the police and the underworld.

By means of concealed dictaphones, a system of wire tapping, and careful sleuthing, the commissioner of public safety of the city was able to obtain sufficient evidence to cause drastic changes in the police personnel. Incriminating conversations caught by dictaphone and telephone were reproduced on records and used as evidence.

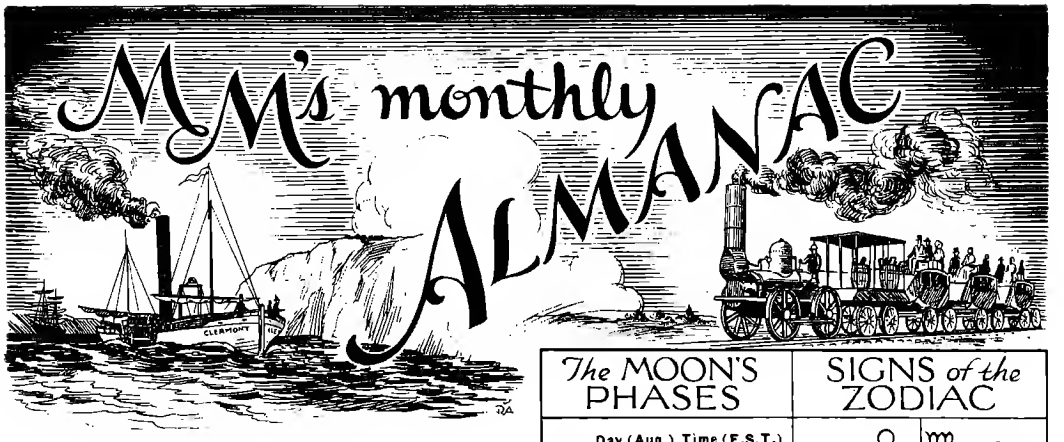


The robot detectives, dictaphones, wire tappers, receivers, and recording instruments, are shown here by Wallace Jamie, who directed the investigation of the St. Paul police force.

Ball Wheeled Skates Are Noiseless

A THREE-WHEELED roller skate using ball shaped wheels with the pivot wheel in the rear, numbers among its advantages complete quietness and long wear when used on sidewalks or in the home. The skates are light in construction, and the wheels have bronze bearings and rubber cushions, for more speed.

These three-wheeled roller skates are noiseless and speedy. The rear wheel serves as a pivot in turning.



Albany, N. Y., turned out en masse on August 17, 1807 to greet Robert Fulton's first steamboat, the *Clermont*, making her maiden trip up the Hudson river from New York City. Twenty-four years later, on the ninth of the month, the first passenger railroad train pulled by a steam locomotive chugged out of Albany on its first run to Schenectady.

The MOON'S PHASES		SIGNS of the ZODIAC	
Day (Aug.)	Time (E.S.T.)	♌	♍
7	8:23 a. m.		
14	7:43 a. m.		
21	10:17 p. m.	LEO— THE LION	VIRGO— THE VIRGIN
28	8:00 p. m.		

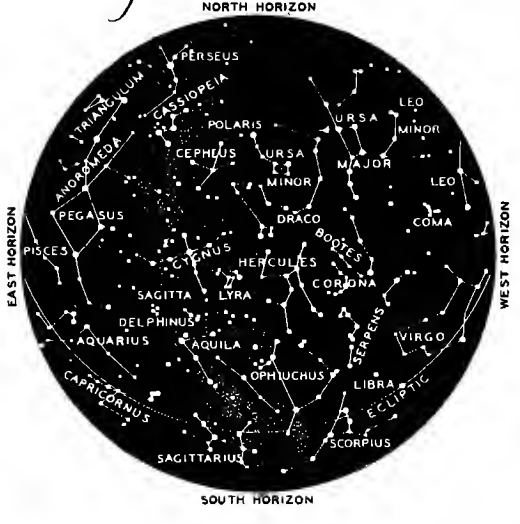
AUGUST

1—In the western plains states, over 1,200 deaths were attributed to the hot weather up to this day in 1934.

5—The first cable message was sent from New York City to Europe, 1858. The cable failed after a few weeks of service.

7—M. Rossi and P. Codos of France set a new distance non-stop record by flying 5,657 miles from New York to Rayack, Syria. 1933.

MAP of STARS in AUGUST



To use map, face south with south horizon at bottom. Map shows sky at 9 p. m. on August 1 or 8 p. m. on August 15.

9—A tractor rescue party succeeded in reaching Rear Admiral Richard E. Byrd, isolated since March 28 at a weather station 128 miles south of Little America, in 1934.

13—A piece of rock 250 feet wide tumbled from the lip of Horseshoe Falls into the foaming gorge at Niagara, 1934.

14—The steamer *Islander*, striking an iceberg in Steven's Passage, Alaska, sank with $30,000,000 in gold. Seventy lives were lost, 1901. The ship was raised by a salvage crew seeking the gold in 1934.

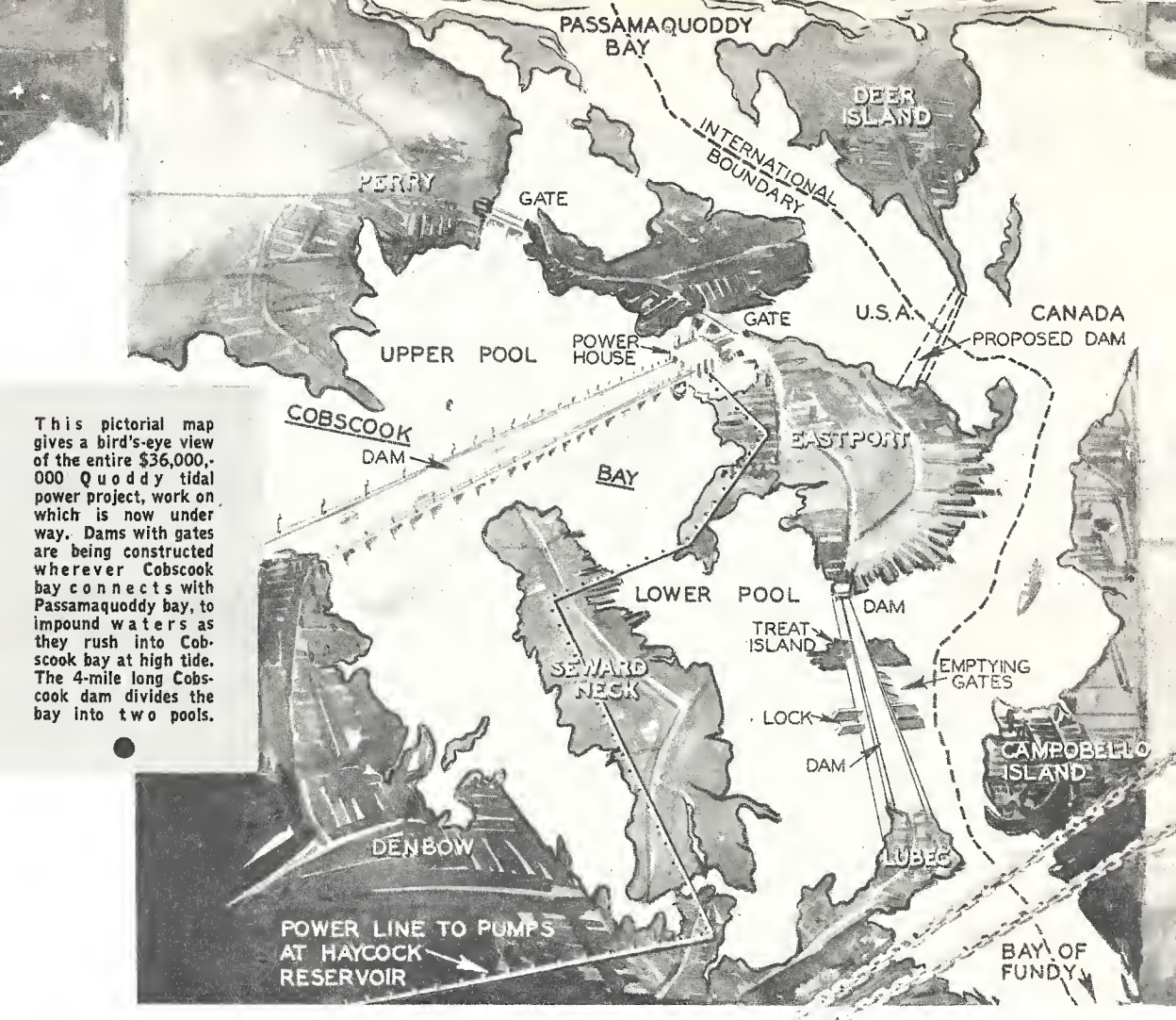
15—On this day in 1914, the Panama Canal was completed and opened to traffic.

24—Forty-two were killed when the U. S. Dirigible ZR-2, purchased from Great Britain, exploded over Hull, England in 1921.

25—The volcanic explosions on the island of Krakatoa were heard in Bangkok, 1,400 miles away. Thousands of lives were lost. 1883.

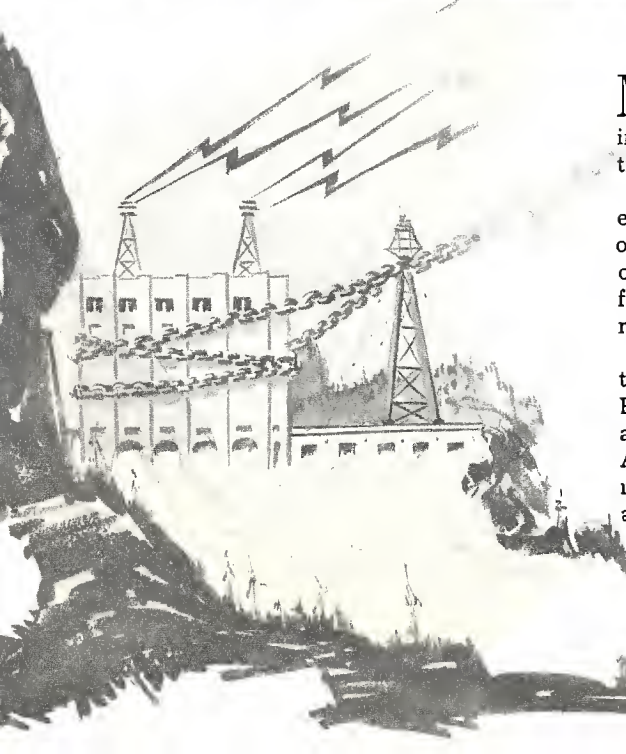
27—The first petroleum well in the U. S. was opened at Titusville, Pa., by Edward L. Drake n 1859.

30—The Continental Congress passed a resolution providing for mail service by riders three times a week, 1776.



This pictorial map gives a bird's-eye view of the entire $36,000,000 Quoddy tidal power project, work on which is now under way. Dams with gates are being constructed wherever Cobscook bay connects with Passamaquoddy bay, to impound waters as they rush into Cobscook bay at high tide. The 4-mile long Cobscook dam divides the bay into two pools.

by **WEBSTER F. CAREY**

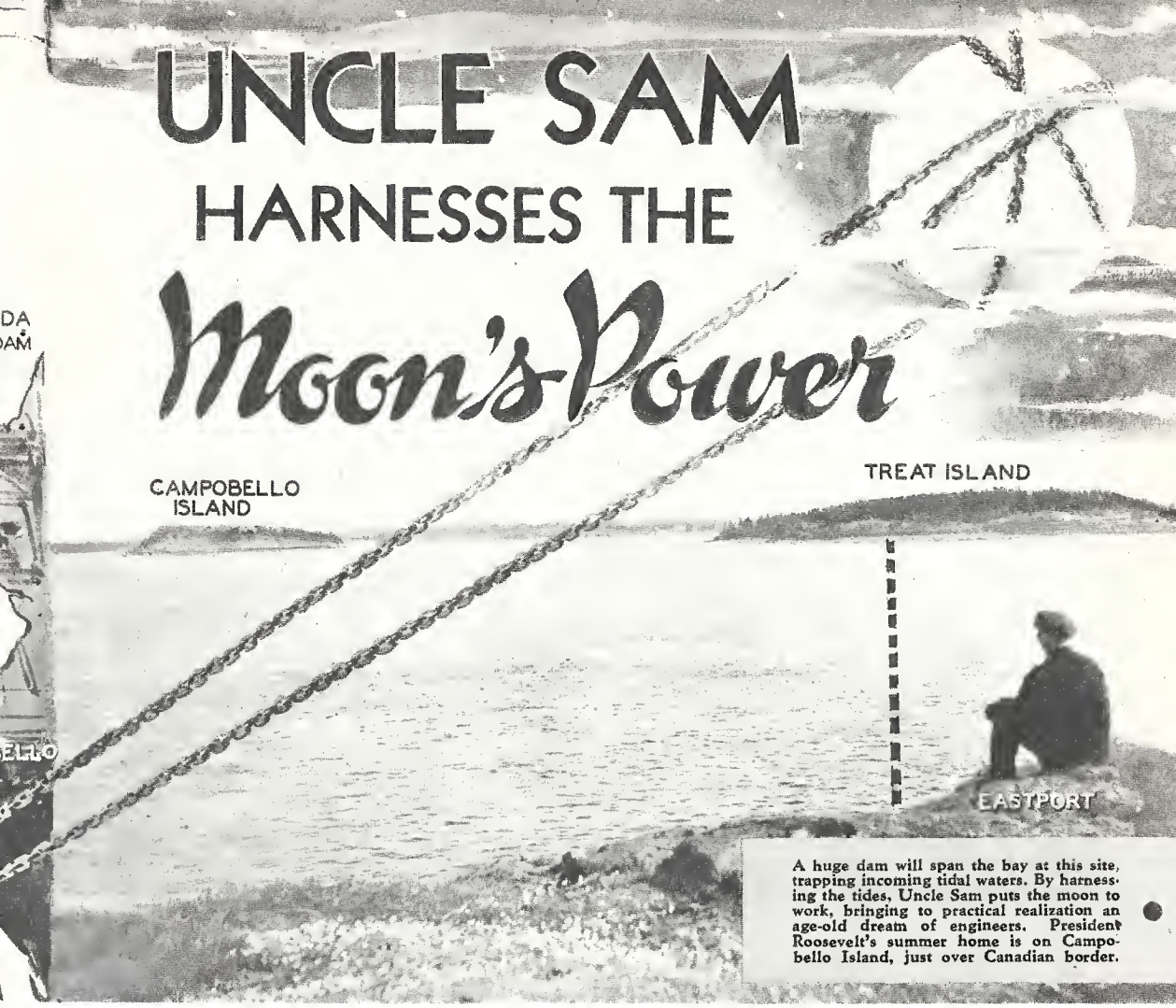


MAN'S centuries-old dream—to turn the force of rising and falling ocean tides into power—to harness the moon, creator of tides—soon will come true.

A series of dams, a tidal power house, an emptying gate and a lock will trap the tides on Cobscook bay, an inlet on the American side of Passamaquoddy bay in Maine, and provide for generation of electrical power as the water rushes into the huge machine-made lake.

Engineers recently have found a simple, though ingenious, way to control the tide at Passamaquoddy. At that point the tide rises and falls an average of 19 feet twice a day. A funneling effect sometimes causes the inrushing water to advance like a huge wave, at times 60 feet high. It is the highest tide

UNCLE SAM HARNESSES THE *Moon's Power*



A huge dam will span the bay at this site, trapping incoming tidal waters. By harnessing the tides, Uncle Sam puts the moon to work, bringing to practical realization an age-old dream of engineers. President Roosevelt's summer home is on Campobello Island, just over Canadian border.

near civilization which provides usable power.

"Tide traps" now being designed by army engineers for the $47,000,000 project come as near to harnessing perpetual motion and supplying perpetual power as any method yet devised.

A series of five dams, the largest four-fifths of a mile long, will cut off Cobscook bay from the Bay of Fundy, which is open to the sea. When completed, the water level in the bay will be maintained at the level of low tide. When the tide rises five feet, twice each day, the sea will be turned into the bay through a series of turbines.

Fourteen hours daily the turbines will whir, as the tides rise from the five-foot mark to high, then flow out again. During each period the thirty-seven square mile lake will rise two and one-half feet. To empty it during each 90 minutes of low tide, the engineers will make use of 25 Venturi-type gates, each 30 feet tall and 30 feet wide at the narrowest point. When the water levels inside the lake and in the outer bay become equalized, the gates will be closed, and when the outer water rises five feet, generators will hum again.

Although the "tide traps" will be closed down for two five-hour periods each day, the great project will furnish continuous power. Fifteen miles south of Cobscook bay the army plans to create an 8,000-acre storage reservoir. Levees will rise from 10 to 30 feet around the big basin to hold back the water.

As the tides rise and fall, surplus power will be transmitted over a high tension line to the reservoir to pump water from the sea 135 feet up into the new lake. During shutdown periods at the main tidal plant, this stored water will be used to generate power at the nearby Haycock power plant.

Funds provided by the Emergency Relief Appropriation of 1935 will make possible production of enough power to supply all industrial and domestic needs within a radius of

27-FOOT TIDES are TRAPPED at QUODDY

300 miles on the American side of the border. Later, it is planned to create other "tide traps" and, through international cooperation, provide similar service in Canada. Ultimately 366,674 K. V. A. of power will be developed. This power will be dependable, for tides in this region have never been known to vary.

The initial development, which is scheduled to be completed late in 1937, is being so constructed as to be readily adapted to the much larger two-basin plan, utilizing both Passamaquoddy and Cobscook bays. This expansion will make it a real international scheme, as the second basin lies almost entirely within Canadian waters.

In the final development the upper basin of Passamaquoddy bay will be cut off entirely from the sea by a second series of dams, locks and a giant gate.

"Power would be generated through the same power house now being constructed as part of the earlier development," explained Major Philip B. Fleming, of the army's corps of engineers, who is directing the building of the project, "it being necessary only to install more units. The great advantage would be that the head (flow of water) would be more nearly constant instead of fluctuating with the tide, so that a fairly steady source of primary power will be provided."

The dams which will cut off Cobscook bay will be built in currents flowing as rapidly as nine miles an hour. Some will go as deep as 140 feet below the surface. Construction will be accomplished by "floating" huge rocks, dropping them up-current at carefully calculated distances. The tides will carry them into place on the bottom. All the dams, which will range in height from 30 to 150 feet, will be of earth fill, rock armored and rock fill types.

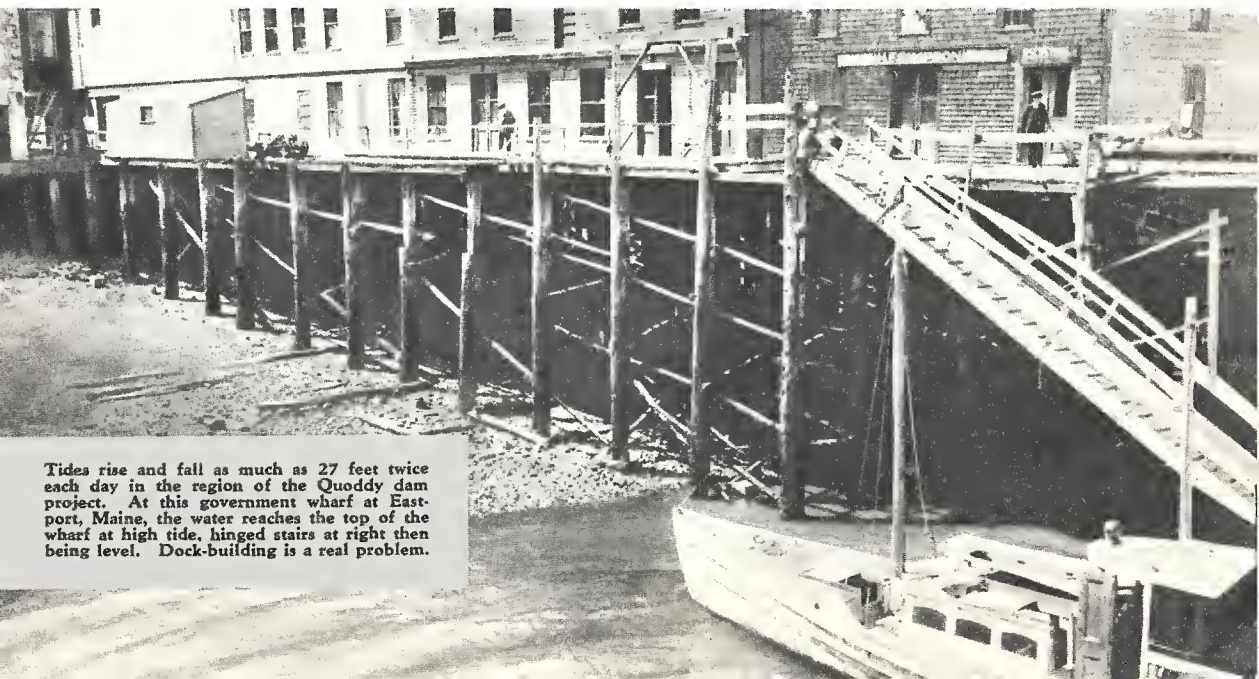
Of the 22 turbine units eventually to be installed in the power house, 10 will be placed in operation initially. Each turbine will turn at a maximum speed of 50 revolutions a minute.

The emptying gate structure will consist of a battery of massive vertical lift gates in Venturi-type sluices. Their design may be easily pictured by thinking of two oval surfaces held near each other. Water crowds through the narrow opening and expands on the escaping side to produce a vacuum effect, which pulls behind it a great volume endeavoring to rush past the gate. Each gate will discharge 550,000 cubic feet a second!

A navigation lock will be installed to permit ships to reach the interior basin and its tributary area.

The pumping plant at the Haycock lake will have a capacity of 180,000 horsepower.

The "Quoddy tide trap" culminates the dreams of engineers who have tried unsuccessfully on several novel projects of the last 40 years to utilize power from the sea, and is a tribute to the genius and persistency of Dexter Cooper, a Maine engineer who "sold" the idea to the government.



Tides rise and fall as much as 27 feet twice each day in the region of the Quoddy dam project. At this government wharf at Eastport, Maine, the water reaches the top of the wharf at high tide, hinged stairs at right then being level. Dock-building is a real problem.

Patients In Revolving Hospital Have Sunny Rooms All Day

SUNLIGHT exposure during the entire course of the day is provided patients in a revolving hospital ward at the Institute of Actinology in Vallauris-Le-Cannet, France.

Patients afflicted with diseases requiring ample dosages of sunlight are treated at this hospital, declared to be the most up-to-date in France. As the sun rises in the morning, all rooms face the east, and then as the sun crosses the sky, the ward revolves on its axis to follow its course.

The most up-to-date hospital in France is this weird-looking structure near Cannes. The upper half revolves to face the sun all day long to give patients the benefit of the rays.

Wood Supplies Fuel for New Car

"Fill her up" says this German as he drives into the latest, and oldest, thing in filling stations. This new car goes 100 miles on 75 pounds of wood, and has a speed of 80 miles an hour.

THE old time wood pile is due to become the ultra-modern filling station of Germany following the recent perfection of a new automobile which consumes wood instead of gasoline.

The car uses about 75 pounds of wood in traveling 100 miles, and has a top speed of about 80 miles per hour.

Earth Has Elastic Inner Shell

ANY deposits of valuable minerals that might be buried several miles beneath the earth's surface are doomed to remain there forever, tests conducted at Harvard University show.

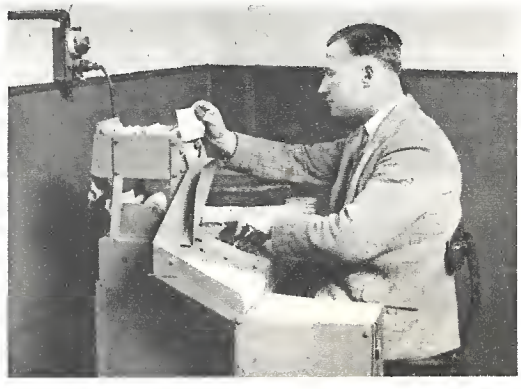
According to the tests, completed by Dr. Albert Zisman, the layer of rock which lies 35 miles under the surface, has been so affected by tremendous pressure that it is elastic, with all its pores and cracks pressed out. If, in spite of heat, a shaft were drilled in it, the pressure would instantly close in.

Robot Speeds Work of Sorting Mail

POSTAL authorities are watching with interest the results being obtained from a robot letter sorter now being tested at the Brighton G. P. O. in England. Tests have already shown the machine to be twice as fast as a mail clerk in "throwing" the mail.

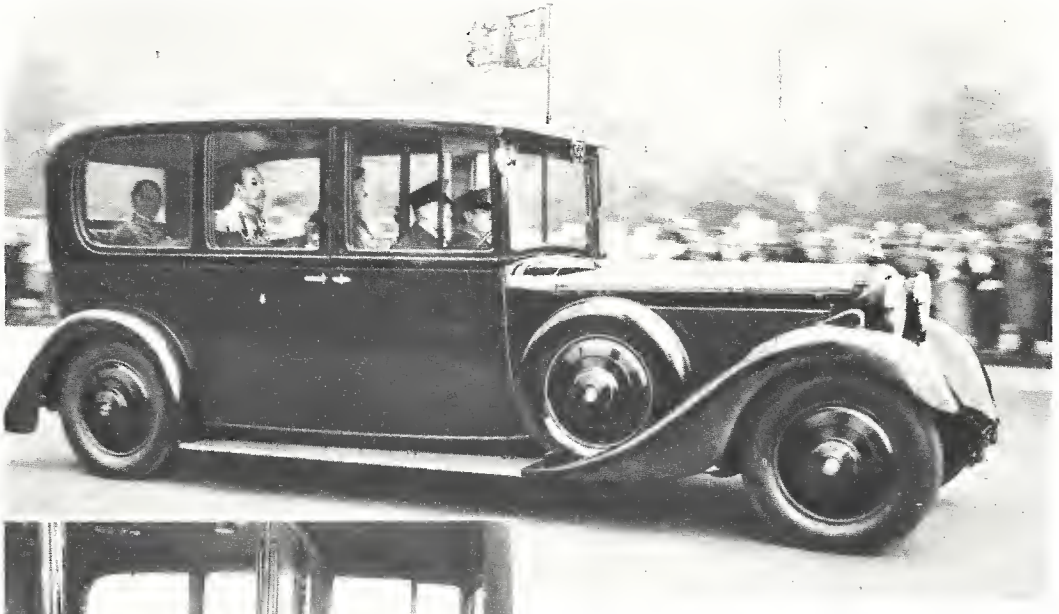
Various towns in England which are used as mail distributing centers, are designated by numbers on the keyboard of the robot. As a letter is fed into the machine, the operator glances at the address, presses the corresponding number, and the letter is whisked into the correct mail pouch.

After being thoroughly tested at the Brighton post office, it is expected that the sorter will be placed in use in the larger mail terminals where speed and accuracy in handling thousands of letters hourly is essential.



This robot letter sorter is operated by a keyboard on which the principal cities are designated by number. It is only necessary to press the required button and the letter is pouched.

Largest Car Replaces the King's 'Orses



This unusual photo of King George and Queen Mary was snapped as they passed in the new Royal State car during their Silver Jubilee celebration. Note the royal standard flying above the roof, and the royal emblem mounted above the wind shield. Built by Daimler, the car has a V-12 motor, a fluid flywheel, and a pre-selector gear box. Because it will have to run for long periods at low speed, it has special carburetion and exhaust manifolds to eliminate gases. Below —The chair seats are used by the king and queen on special state occasions. There is room for two chauffeurs in front and for two guests in back, directly behind the royal couple.

KING GEORGE and Queen Mary of England—whose state and ceremonial appearances for a quarter of a century have been made in the traditional horse-drawn carriage—have become motor minded. For the first time in history the king and queen are making their state appearances by car.

The ceremonial car carries on the panels of the body the royal crest and the order of the Garter, while the royal crown is emblazoned on the main doors and the back panel. At night a small blue lamp, permitted only on the king's car, shines from the center of the windshield. The land cruiser, hailed by the British as the world's largest car, flies the royal flag on state occasions. It has a wheel base of 13 feet, with a track of 5 feet, 4 inches.

King George does not like fast travel, and has adapted the pace of 40 miles an hour, a speed decreed in the 1890's by Queen Victoria when she first rode by train.

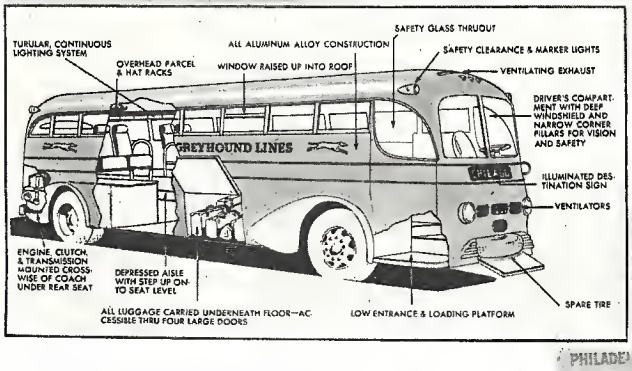
Youth Builds Mystery Speed Boat

IN A SPECIAL "mystery" boat of his own design, R. Stanley Dollar, Jr., of San Francisco, was the United State's only entrant in the Spreckels Trophy speed boat classic held on the Seine river in Paris.

The youthful racing enthusiast, son of the president of the Dollar Steamship Co., has spent considerable time developing speed boat designs in his shop on San Francisco Bay. His "mystery" boat, the "Uncle Sam," represents several months of experimenting.

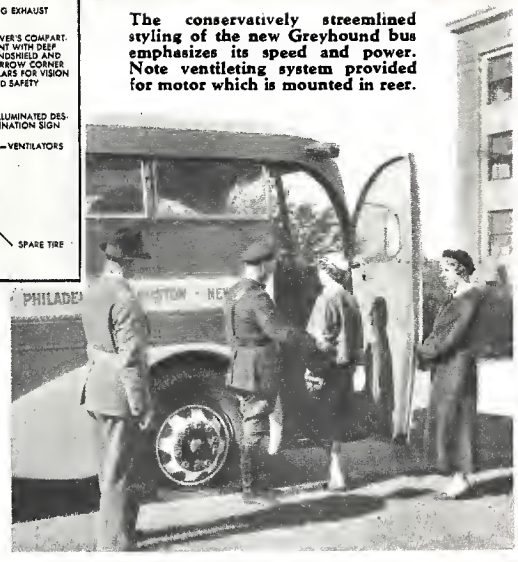
This photo shows R. Stanley Dollar, Jr., America's only entrant in the French speed boat classic, in the "mystery" boat he designed himself for participation in the famous race.

New Greyhound Bus Has Motor in Rear


TURULAR, CONTINUOUS LIGHTING SYSTEM
OVERHEAD PARCEL & HAT RACKS
ALL ALUMINUM ALLOY CONSTRUCTION
WINDOW RAISED UP INTO ROOF
SAFETY GLASS THRUOUT
SAFETY CLEARANCE & MARKER LIGHTS
VENTILATING EXHAUST
DRIVER'S COMPARTMENT WITH DEEP WINDSHIELD AND NARROW CORNER PILLARS FOR VISION AND SAFETY
GREYHOUND LINES
ILLUMINATED DESTINATION SIGN
VENTILATORS
ENGINE, CLUTCH, & TRANSMISSION MOUNTED CROSSWISE OF COACH UNDER REAR SEAT
DEPRESSED AISLE WITH STEP UP ONTO SEAT LEVEL
SPARE TIRE
ALL LUGGAGE CARRIED UNDERNEATH FLOOR—ACCESSIBLE THRU FOUR LARGE DOORS
LOW ENTRANCE & LOADING PLATFORM

Every inch of spece in this modernistic coach is applied directly towards greater passenger comfort. Note tbe ebsence of luggage cerriers on the roof, all baggage being stored below decks as shown in this phantom drawing.

The conservatively streemlined styling of the new Greyhound bus emphasizes its speed and power. Note ventileting system provided for motor which is mounted in reer.



Conveniently placed steps lead to a recessed eisle which runs the entire length of the coach. The seats are pleced on a deck one step above the aisle. Thougb it eppears higher, the new coach actually is lower tban the everage bus.

KEEPING pace with the developments in luxury motor travel, the Greyhound bus system has introduced a new type of passenger coach which incorporates new comfort and safety features in almost every construction detail. It is expected that hundreds of the new coaches will be placed in service on all lines operated by the system within the next few months.

The most radical departure from conventional bus styling is the absence of the hood, the motor being installed cross wise in the rear. This permits a capacity of 36 passengers instead of 33, and gives the driver an unobstructed view of the road.

The passenger deck is mounted high above the vibration line, and both travelers and driver can see over the tops of passing cars. The high deck also eliminates the uncomfortable "wheel housing" seats. In spite of this height, however, engineers have designed the coach so that the weight is swung lower than ever, increasing the safety factor and ease of handling.

The luxuriously upholstered seats are built over magnesium and aluminum alloy frames, and can be tilted for sight seeing, reading, or sleep. There is ample space between chairs.

Glowing tubes of frosted glass, extending through the center of the coach and around the sides, give a soft diffused light, with no visible bulbs. Ventilation is provided by four air ducts, two side ducts being supplied with fresh air from intakes over the windshield, and two center ducts expelling used air through the ceiling.

All windows, including the oversize windshield, are made of shatterproof glass.

Lindy's Invention Perfects

by RAYMOND L. BOWER

MEDICAL science has machines that will breathe for you, talk for you, hear for you, eat for you, circulate your blood—and even sweat for you—if you should ever happen to need them. Colonel Charles A. Lindbergh, a mechanical genius as well as a great aviator, has recently constructed a "mechanical heart" by means of which vital organs can be kept alive outside the body for months and probably years. So far, of course, only animals have been used in the experiments with the mechanical heart conducted at the Rockefeller Institute by the famous medical research man and Nobel prize winner, Alexis Carrel.

To Lindbergh goes the credit for another piece of scientific apparatus, a blood testing device which operates on the same principle that keeps a ball suspended in midair by the force below a spray of water.

This new invention separates the red corpuscles of the blood from the liquid part of the blood, not by centrifugal force as in old equipment, but by a washing process which delivers the corpuscles without distorting their shape.

But Lindbergh's work in mechanics, coupled with Carrel's work on living tissues, recalls attention to the fact that there is almost no part of the human body that cannot be replaced or supplemented by some machine or drug.

Normally, the body strives to retain its natural functions. That is why there are two of most (not all) important organs. If one kidney is removed, for example, the remaining kidney will increase in size and do the missing kidney's work.

Unfortunately, there is only one heart. When that stops, the body stops. Everyone knows that the heart is nothing more than a delicately-balanced, though very strong and enduring, pump. At regularly-timed intervals it spurts the blood into the main arteries and from there along the lesser arteries until it finally goes through the thousands of miles of capillaries (very tiny blood vessels) which reach every last little cell in the body.

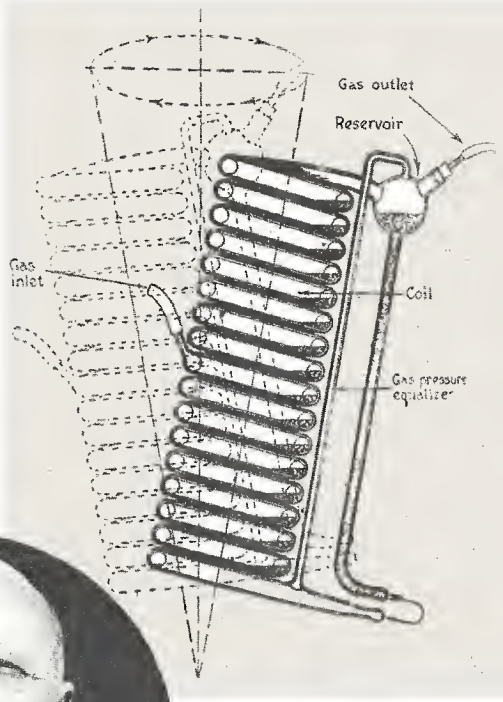
What Lindbergh has done is to build a pump of glass and metal which will go on for days shooting streams of blood (or any other fluid) into an organ, such as the liver, which has been removed from the body. By means of

Deaf and dumb children hear the songs of a radio star through tiny devices which, pressed against the bone near the ear, create mechanical vibrations which can be heard. At left are two forms of the artificial larynx—one which requires insertion of a silver pipe in the throat (here a hand-operated bellows is supplying the air), and latest model producing a pure tone electrically.

the Mechanical Man

Lindbergh's new "mechanical heart" calls attention to the fact that medical science even now has marvelous machines which will replace parts of the human body or do the work of parts that fail.

Col. Charles A. Lindbergh, in collaboration with Dr. Alexis Carrel, below, startled the medical world with the announcement of an artificial heart which can revive and sustain life in organs which have been removed from animals. Lindbergh spent five years in secret biological research at Rockefeller Institute, New York.



This diagram shows the first form of the mechanical heart, invented by Lindbergh four years ago. The present device is similar in principle. The coil of glass, rocked to and fro, pumps feeding solutions through living organs. A lung-effect is obtained by admitting oxygen through the tube show at the left center.

a thin tube, the mouth of the pump is attached to the main blood vessel of the removed organ, which remains in a glass jar filled with infection-resisting fluid. Every time the pump tilts, a stream of feeding solution (not blood) passes along the tube and so into the artery and the capillaries. The removed organ will live as long as it has food and remains free from infection.

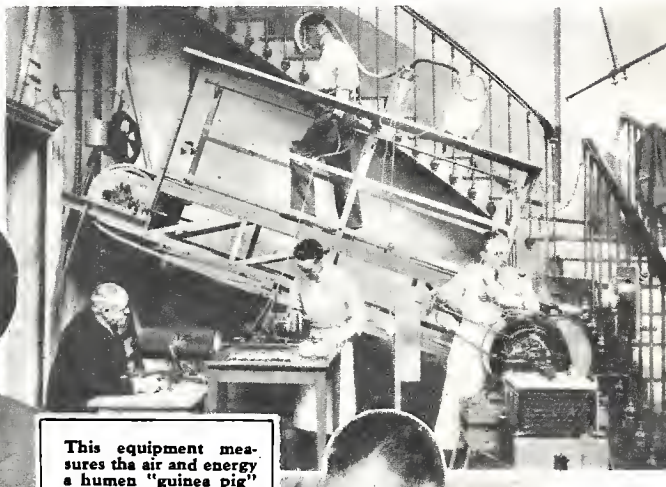
At present, the mechanical heart is being used for experimental purposes only. With it doctors will be able to find out exactly how vital organs of the body do their work. This is more accurate than the research methods now applied directly to human beings.

Doctors to-day have several machines that will breathe for you. The pulmotor, applied over the face, forces air directly into the lungs. The Drinker respirator, a cabinet within which are created alternating air pressures, takes the place of the muscles which operate the lungs, just as the pressure of the hands on the ribs is employed in the Schafer method of artificial respiration. The oxygen tent or oxygen-tube, fitted through the nose, delivers concentrated volumes of this life-giving gas to the choking patient.

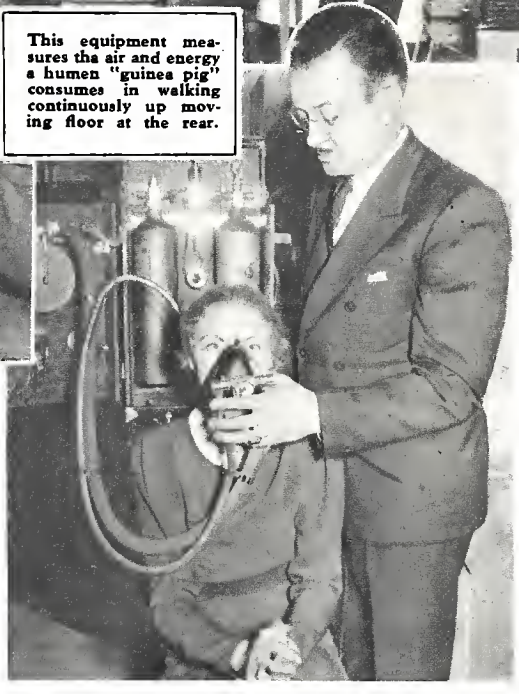
There is another machine, worked by electricity, which will set a heart beating again after it has been stopped for a few minutes—by some sort of shock, electrical, operative,

MACHINES WILL HEAR AND BREATHE FOR YOU

A special device, replacing the loudspeaker on a public address amplifier, converts electric signals into mechanical vibrations which can be "heard" as sound through finger tips.



This equipment measures the air and energy a humen "guinea pig" consumes in walking continuously up moving floor at the rear.



Here is the first automatic rasuscitation unit, a machine which can do your breathing. It is used for cases of drowning and asphyxiation, forcing inhalation of oxygen and exhalation of used air and gases. The unit weighs 75 pounds complete.

etc. This machine, called the "artificial pacemaker" depends on the fact that the heart has a "timer," a little bundle of nerves called the "bundle of *His*" after its discoverer, Wilhelm His, Jr. This bundle of nerves tells the heart muscle when to contract. When the bundle fails to operate, a long needle is pushed through the chest into the heart. At the end of the needle is a tiny spark-gap. An electrical machine shoots tiny sparks across this gap in the same rhythm that the bundle of nerves usually adopts, 60 to 72 a minute. These electrical impulses start the heart beating again (in many though not all cases) until the bundle of *His* picks up the rhythm and gets back on the job. The artificial pacemaker is then withdrawn.

Sometimes, as when a leg is frozen or its arteries wear out, a machine is necessary to circulate the blood in the leg. If the blood failed to circulate, the tissues would die from lack of nourishment — just as the animal organs did when removed from the body before Lindbergh's mechanical heart came to the rescue. The "pavaex" machine circulates the blood in the extremities. It consists of a glass boot, fitted over the leg to form an air-tight chamber, and a pump which delivers alternating positive and negative pressures within the boot. When this is turned on, the tiny blood vessels get an opportunity to expand and contract more easily and send along the slow-moving blood.

Occasionally, after a severe operation, a patient cannot eat and has to be fed by mechanical means. One method is called "intravenous drip." A needle is inserted into

[*Continued on page* 123]

"Flying Fish"—New Tailless Plane—Impresses Parisians

RESEMBLNG the giant devil-fish in exterior design, a new tailless plane built in France is attracting much attention in aviation circles.

In flight the plane, called the "Flying Fish," has proven extremely easy to handle, and, when carrying two passengers, has a cruising speed of more than 120 miles an hour.

The wings are triangular in shape, and extend almost the full length of the stubby fuselage. Ailerons have the same length as the wings and replace the customary horizontal stabilizers and elevators on the tail.

Already winning admiration in aviation circles is this "Flying Fish," the product of a French aviator. The outstanding features of this tailless plane are its exceptional stability in rough air and its ease of handling.

Canvas Bag Becomes Air Pump

Three strokes of this novel canvas bag air pump are sufficient to inflate an air mattress. The bag also can be used to hold water for a shower bath or as a duffle bag.

IN THE hands of a California manufacturer, a simple canvas bag becomes an air pump for inflating air mattresses, a water bag, a reservoir for a shower bath, or a regulation duffle bag.

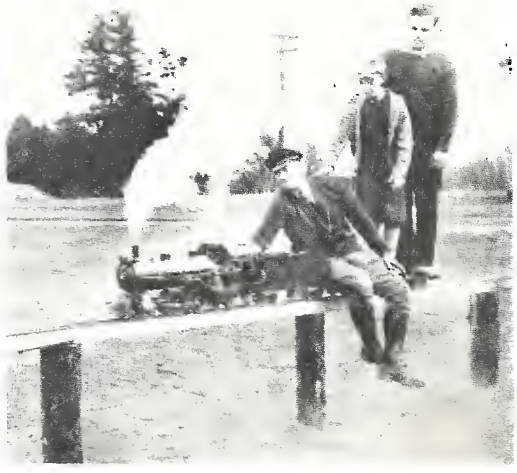
For use as an air pump, a rubber hose is connected to the bag and the mattress, and the bag pumped up and down. With the bag filled with water and hung in a tree, the same hose can be attached to a shower sprinkler. The bag will store water for long periods without leaking.

Model Locomotive Hauls Ton

A MODEL locomotive, complete in every working detail and yet weighing only 150 pounds, has been built by hand by Eugene Stevens of Norway, Maine. The model, 5½ feet long, can pull a ton load at high speed over its improvised track.

The boiler of the machine holds 2 gallons of water, and the coal burning engine develops 120 pounds of steam pressure to power the four drive wheels. Its tiny tracks are laid trestle fashion on cedar posts in Steven's yard.

The midget steam gauge, scarcely the size of a man's thumb, registers the pressure accurately. The bore of the cylinders is $1\frac{5}{16}$ inches, and stroke of the pistons 1¾ inches. The engine tender carries 6 pounds of coal and 2½ gallons of water to augment the supply in the boiler.



This 5½ foot model locomotive, complete in every detail, can haul a one ton load of freight. Eugene Steven, who built it by hand, is shown giving his neighbors a ride on the flat car.

PARAGRAPH ODDITIES OF SCIENCE

ANGLEWORMS grow 12 feet long in Australia. The earthworm *Megascolides Australis* varies in length from 3 to 12 feet, and makes a queer, gurgling noise when burrowing through the mud.—J. L. Evans, St. Paul, Minn.

A common toad is worth more to a farmer than a small hog. Because of the insects it eats, the toad saves $19.44 annually.—Paul Field, Payette, Idaho.

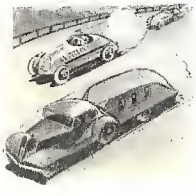
The entire North American continent would be reduced to ashes by a thimbleful of matter taken from the interior of certain stars. Scientists assert the temperature inside a star is 50,000,000 degrees Centigrade.—Milton Harris, New York City, New York.

Simplest of weather bureaus is the frog barometer, made by placing a frog in a jar of water. If the frog goes to the bottom, bad weather is on the way. Fair weather is coming if he stays on top.—W. E. White, Jr., Attleboro, Mass.

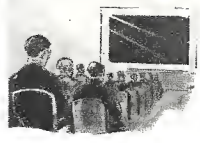
Mechanical refrigerators were built for freezing meat as early as 1861 in Australia.—Robert Helliwell, Sydney, Australia.

Liquid air is five times more powerful than dynamite. It exerts 10 tons of pressure to the square inch when confined.—Edmund Mikulski, Jersey City, New Jersey.

A 1,500-pound trailer hitched to the back of a standard coupe increases the speed of the car 11 per cent if properly streamlined. The trailer lessens the vacuum pulling the car back.—Loren Bureman, Buckner, Missouri.



Movie patrons spend more than half their time looking at a screen that is totally blank. Three blades on the projector cut off light, one while a new picture is brought down, the others to reduce flicker.—C. W. Stull, Lexington, Virginia.



The exhaust gases from an automobile are not poisonous until they have mixed with the outside air.—H. L. Manheim, New Rochelle, New York.

Two sounds make silence. When two sounds of the same frequency are produced so that they are exactly 180 degrees out of phase, the result is silence.—H. Daniels, Portland, Ore.

Parliament Street in Exeter, Devon, England, presents a serious traffic problem, and yet it is never used by automobiles. It is only two feet wide, and two fat people cannot pass between the walls.

Poisonous snakes cannot be rendered harmless by pulling out the fangs. New fangs grow within a few days.—G. R. Hampton, McCamey, Texas.

Tigers almost evened the score in India last year. There were 1,068 tigers killed by men, and 1,033 men killed by tigers.—Vivian Kimball, Walworth, Wis.

A person must be at least 55 feet away from a sound reflecting surface to hear an echo under ordinary conditions. The ear cannot detect sound impressions less than one-tenth of a second apart.—Ernest Kunkel, Perryton, Texas.

One dollar will be paid on publication for every Paragraph Oddity accepted. State source or proof. Do not include Oddities with contributions or letters for other departments. No items will be returned.

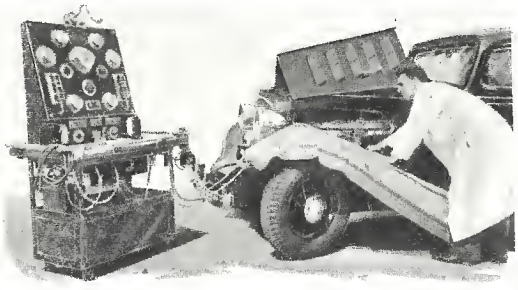
Dynamite Blast Gives Niagara Falls Latest "Face Lifting"

THE gradual disintegration of the rock beneath Niagara Falls during the past year has resulted in numerous changes in the cliff over which the Niagara River plunges. Huge rock slides have crashed into the gorge below, radically altering the appearance of the falls, long the mecca of honeymooning couples.

Fortunately, most of the rock slides have occurred at night, endangering no one. However, to prevent possible danger during future crashes, engineers have surveyed the cliff carefully for signs of weakness, and where ever such spots are found, dynamite blasts anticipate the work of the river. Recently a dangerous lip overhanging Horseshoe Falls was blasted away in this manner.

A charge of dynamite, weighted down by railroad ties gave Niagara Falls her latest face lifting operation. Water had so undermined the cliff that it was a menace to sight-seers.

Physical Exams Now Given Cars



This motor analyzer is shown registering the efficiency of the generator on the car being tested. It detects any flaw in the ignition system, and also checks motor performance.

COMPLETE physical examinations for automobiles are now possible on a motor analyzer manufactured for use in garages and service stations.

The device contacts all parts of the ignition system, and by means of a large instrument panel various defects in the motor's performance are detected. Among the services it renders is a complete test of battery and starter, cylinder compression, ignition coil at high and low speeds, condenser, engine vacuum, fuel pump, vacuum tank, generator charging rate, cut-out action, and all wiring connections.

Processed Wood Will Not Warp

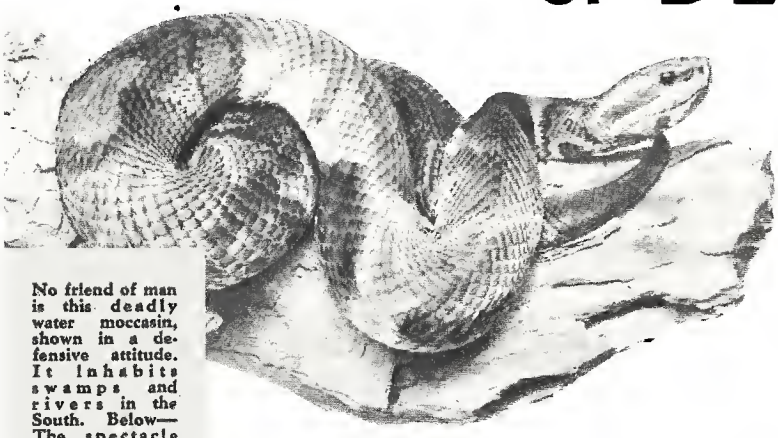
THE ancient problem of carpenters and cabinet makers of finding a wood that will not warp has been solved by the laboratory department of the United States Forest Service. The solution is not in a new type of wood but in a special treatment for all woods which penetrates and seals the pores.

Salmon Become Prey of Archers

BOW and arrow salmon fishing is a sport rapidly coming into its own in California. Salmon headed upstream travel fast but close to the surface, and an alert bowman has plenty of opportunity to exercise his skill. Steel barbed arrows attached to fishing lines are used, and the fish is played by hand.

Leah Thomas, Garberville, Cal., demonstrates how salmon are "hooked" by bow and arrow. The ingenius reel, through which the arrow is shot with line attached, is the invention of her father. The line, looped over pegs, pays off readily.

SEEKING *Poison* of DEADLY



No friend of man is this deadly water moccasin, shown in a defensive attitude. It inhabits swamps and rivers in the South. Below—The spectacle cobra, one of the most deadly of all snakes. This species is not as large as the king cobra, but is every bit as poisonous.

An Interview with

DR. RAYMOND L. DITMARS

by

RALPH DAIGH

HAVE I handled more poisonous snakes than any other man?

Well, I won't fight for that distinction, yet I believe it is mine. In almost forty years of experimenting with deadly reptiles, I have literally captured several tons of them personally, and have purchased thousands of snakes from natives and dealers.

My search for poisonous snakes has carried me throughout our own country and the tropics. Yet, my most extraordinary and thrilling snake hunting adventure occurred in downtown New York.

"Two king cobras are loose in my store," a frantic animal importer told me over the tele-

Dr. Ditmars is shown "milking" a water moccasin. When the fangs penetrate the gauze, venom is spurted into the glass. Note his grip on serpent's head, just below the poison sacs.

Fangs SNAKES

From the lethal fangs of poisonous snakes, Dr. Ditmars, Curator of Mammals and Reptiles at the New York Zoological Park, is extracting a fluid which is aiding science in the fight against disease. Read of his experiences in this interview.

One contact with a poisonous snake usually provides enough thrill to last a life time, but to quiet, unassuming Dr. Raymond L. Ditmars (above) deily contacts for elmost 40 years are all in the day's work. Snakes strike at him repeatedly, but he has never been bitten. His advice to amateurs who would hunt poisonous snakes is simple and straight to the point, "DON'T."

phone. He implored me to capture the reptiles.

King cobras!

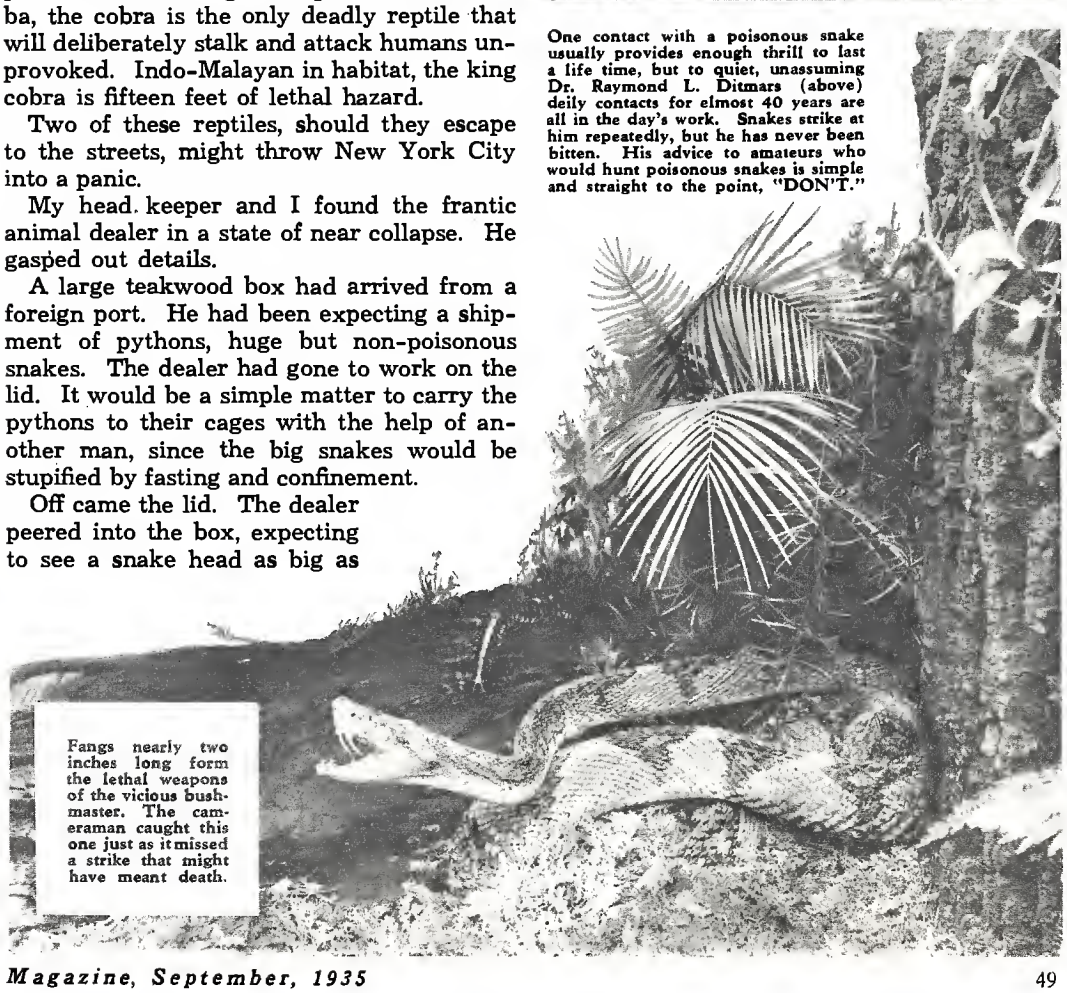
Largest and most active of poisonous serpents. With the single exception of the mamba, the cobra is the only deadly reptile that will deliberately stalk and attack humans unprovoked. Indo-Malayan in habitat, the king cobra is fifteen feet of lethal hazard.

Two of these reptiles, should they escape to the streets, might throw New York City into a panic.

My head keeper and I found the frantic animal dealer in a state of near collapse. He gasped out details.

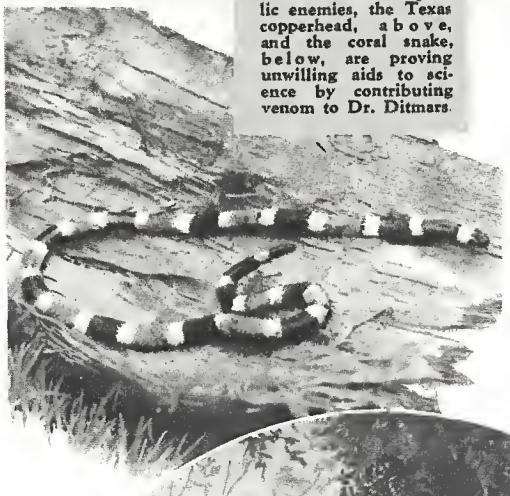
A large teakwood box had arrived from a foreign port. He had been expecting a shipment of pythons, huge but non-poisonous snakes. The dealer had gone to work on the lid. It would be a simple matter to carry the pythons to their cages with the help of another man, since the big snakes would be stupified by fasting and confinement.

Off came the lid. The dealer peered into the box, expecting to see a snake head as big as



Fangs nearly two inches long form the lethal weapons of the vicious bushmaster. The cameraman caught this one just as it missed a strike that might have meant death.

DR. DITMARS "MILKS" SNAKES OF DEADLY POISON



Two of America's public enemies, the Texas copperhead, above, and the coral snake, below, are proving unwilling aids to science by contributing venom to Dr. Ditmars.

A scene in Burma, showing how the big python is "enticed" into a cage. Right—The snake handler's tools, a "T" stick to hold the snake's head down, and a crook for lifting snakes from cages. A forked stick placed behind a snake's head is not safe enough.

a fox-terrier's, but belonging to a docile python.

Instead, a low, sibilant hiss, entirely unlike that of a python. Then a whip-like serpent with distended hood reared angrily up before him.

A king cobra!

The terrified man fell back to the door, and just before he slammed and locked the door behind him, saw another supple length boil over the side of the box to the floor. Another cobra!

Our equipment for catching and confining the serpents was two heavy bags, a fiber satchel and a four-foot wooden pole with a cord slip-noose hanging from one end.

The dealer unlocked the door of the upstairs room where he had unpacked the shipment. The keeper and I stepped in.

What a place to hunt cobras!

Boxes and debris littered the floor. It was easy to imagine rats had been at the flooring, possibly had gnawed holes through floors and partitions. Even that instant the cobras might be on their way to the basement, or were already in the streets.

The open door jammed on uneven flooring, so I pushed it shut behind us to leave a clear view of the room. There were two windows, both high up and covered

VENOM OF REPTILES COMBATS DISEASE IN MAN

From the white laboratories of science to the disease infested jungles of the tropics, Dr. Ditmars has adventured with snakes. Read in this interview his accounts of snake charmer's secrets, poison-spitting cobras, tarantulas, scorpions, and the use of snake venom in hospitals.

with wire mesh. The cobras could not escape through those.

Unexpectedly we found the first cobra. We could see a glistening length of him protruding from under a box. His head was hidden, but we knew one prod on that visible coil would bring him flashing out head first and looking for trouble.

I motioned the keeper to remain quiet, then tip-toed back to open the door as a means of escape if we needed it—*but the door was locked!*

The terrified dealer had locked us in with the cobras in his fright.

I knocked on the door cautiously, not daring to bang loudly, as such noise might excite the snake to attack. There was no answer. Evidently the dealer had retreated to the street floor.

So, almost in self preservation, we set out to capture that cobra.

The head keeper had picked up a splintered piece of packing case as we entered the room. He poked the snake with that.

Out whipped the cobra's wicked head, reared up on about four feet of his length. Out blossomed his long, narrow hood, with its black and white spots between the scales.

The cobra shows a cool, almost reasoning intelligence in combat that distinguishes him from other snakes, and makes him more than a worthy adversary. But for an instant, he was puzzled. I knew, from the nervous up and down flickering of the cobra's forked tongue, and other actions, he was hesitating between anger and surprise.

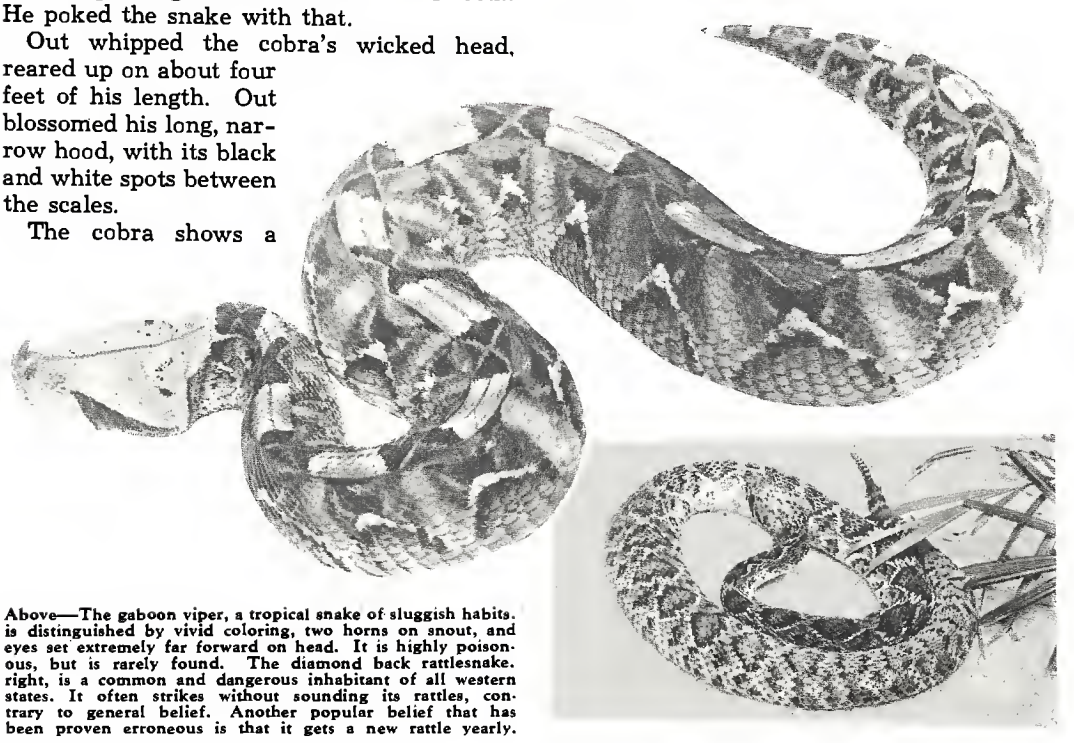
The dangling noose above his head did not frighten him. His eyes were watching me. Down, down the noose dangling from the pole end went, completely over his head. A jerk and the noose was tight.

Then he went crazy with anger. Twelve riotous feet of him surged out from under the box like a steel hawser come to life.

The keeper got his staff across the snake's head, while I made a grab for his neck and secured a good grip right behind the head.

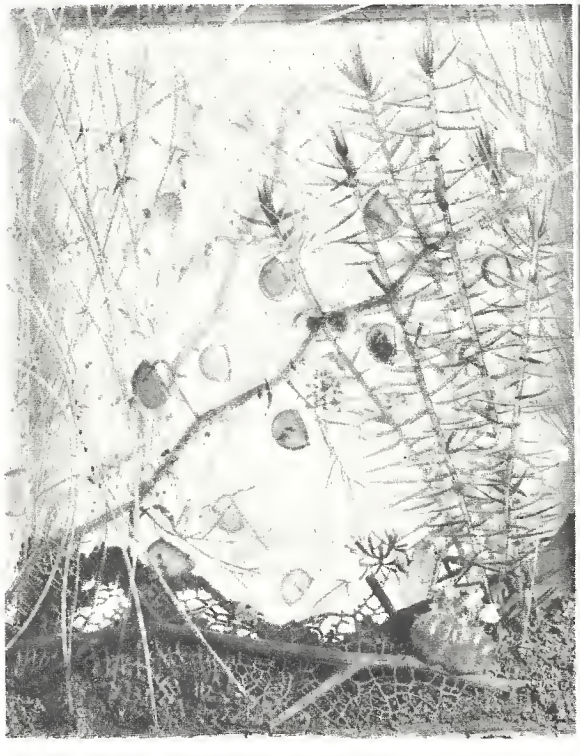
We both held that writhing length while slipping the cobra tail first into one of the

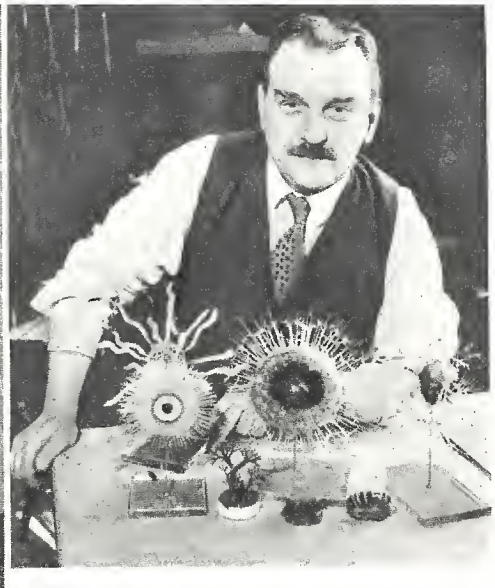
[*Continued on page* 125]



Above—The gaboon viper, a tropical snake of sluggish habits, is distinguished by vivid coloring, two horns on snout, and eyes set extremely far forward on head. It is highly poisonous, but is rarely found. The diamond back rattlesnake, right, is a common and dangerous inhabitant of all western states. It often strikes without sounding its rattles, contrary to general belief. Another popular belief that has been proven erroneous is that it gets a new rattle yearly.

Glass Blower's Magic Models Life In a Water Drop

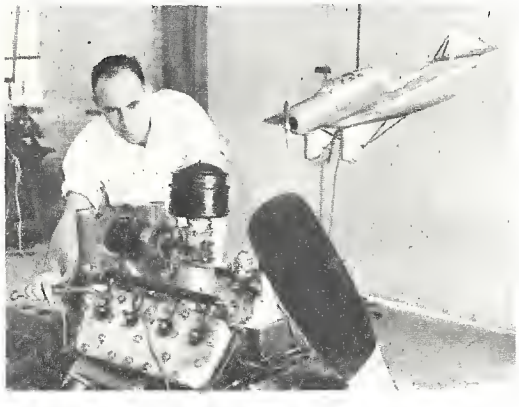




Herman Mueller, the wizard of glass blowars, is shown above with some of the fragile models of microscopic life he has craated from bits of. colorad glass. The greatly enlargad reproductions are built to exect scale, and raquire days of patient, unarringly eccurate work. Left—The organisms in a single drop of water ere shown as thay were reproducad in glass through the megic of Harmen Mueller. Three years of hard work were required to complate this projact.

Plane Built With Ford V-8 Engine

MAXIMUM operating costs of a newly designed airplane, powered by a Ford V-8 motor, are but 50 cents an hour, recent tests conducted in California have shown. The all-metal craft, designed and built by Neill McGaffey, cost less than $1500 and has a cruising speed of 100 miles per hour.



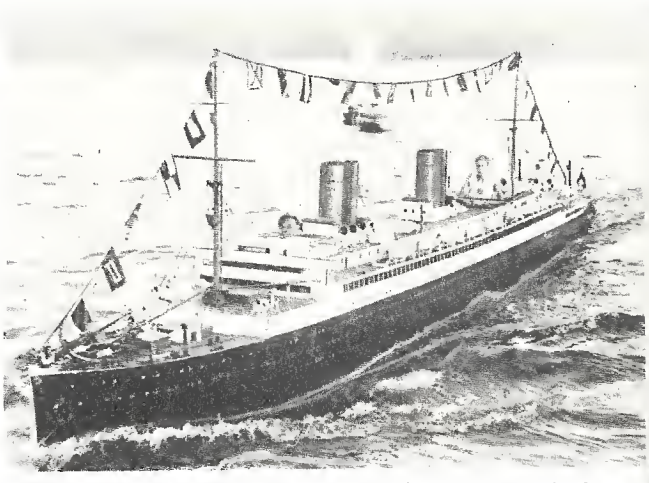
Neill F. McGaffey is shown at work on the auto engine which he is using to power his plane, e modal of which is shown above. Operating cost is but 50c an hour in the air.

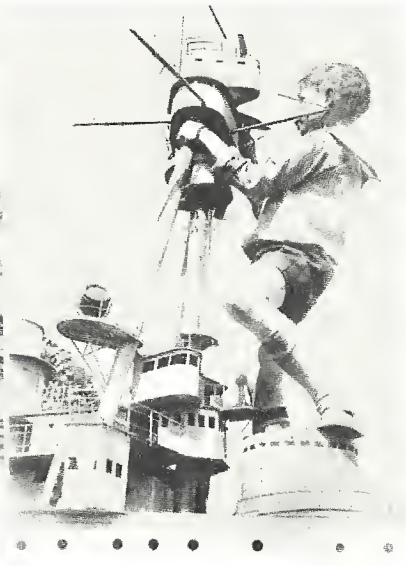
WORKING with glass so fragile it appears about to break under its own weight, Herman O. Mueller of the American Museum of Natural History staff in New York, has spent three years in modeling the minute living creatures found in a single drop of pond water.

Many of the objects which he now fashions for the museum under the direction of Dr. R. W. Miner, Curator of the Department of Marine Life, contain thousands of separate pieces, more daintily woven together than threads of fine lace. His only tools are tweezers, a blow pipe and a piece of carbon to help shape the glass. Glass tubing of various sizes and colors furnishes his raw material.

Detailed drawings, colored in oil, are prepared by various artist-biologists from observations of marine life under the microscope. From these drawings, Mr. Mueller takes his pattern for the model in glass. Hundreds of such models are made from the countless forms of life found in a single drop of water. Annually hundreds of scientists visit the museum to see the life-like but greatly enlarged reproductions of the delicately beautiful creatures.

German Boys Build Scale Model Liners for Sea Cruises





Above—Graduation exercises at a unique marine trade school in Germany consist of taking the model steam boats out for a trial cruise. The above is an exact working replica of the *S. S. Columbus*. Right—A young student is shown working on the super-structure of a model.

EXPERT marine constructionists. between the ages of 9 and 16 are being developed in one of the most novel trade schools of the world at Potsdam, Germany. Under the tutelage of experienced marine engineers, the youths receive a thorough technical training in building exact replicas of real steamships on a scale of one to twenty.

Grades are given according to the aptitude and intelligence shown in building the model vessels. The plans from which the youth work are the same plans, scaled down, of such ships as the Normandie and the Queen Mary. At the end of the school year, advanced students build models that can actually go to sea.

Wire Connector Comes In One Piece

The jaws of this one-piece wire connector lock tightly together, insuring a non-breakable, positive contact that will not jar loose.

POSITIVE wire connections may now be made by means of a one-piece connector equipped with two jaws which lock together, holding the wires as though in a vise. The connector has the same conductivity as the wires. It is tightened by a nut.

Cross Bred Bees Lose Bad Temper

GOOD natured bees who are equipped with long stingers but refuse to use them have been developed by Henry Brown of Burleigh, N. J., as his latest contribution to the field of science. In his efforts to develop a non-stinging bee, Brown found it was easier to improve the bee's temper than to eliminate the stinger. The bees are a cross-breed.

These amiable bees are not stingless. They have long stingers, but Henry Brown, left, has made them so good natured through cross breeding that they have lost their bad habits.

"CHANDU"

by

HAROLD L. ZIMMER

Will L. Lindhorst, the original *Chandu*, tells you how to perform feats of magic which have amazed many millions.

THE original charter of the Society of American Magicians on Nov. 5, 1921 gave to Will L. Lindhorst the title of *Chandu*—a name which today has been made famous by his feats of magic on the stage and by radio broadcasts which have thrilled countless millions.

In this article, I will endeavor to acquaint you with several really worthwhile tricks as *Chandu* explained them to me. Whether or not you wish to become a magician, the tricks presented here will at least afford many happy hours of fun at home or at parties.

One of the oldest yet most baffling of magic tricks is the "Sack Escape." A heavy canvas sack, genuine in every detail is brought forth. Large enough to contain a man, it is passed through the audience for inspection,

The camera catches *Chandu*—Will L. Lindhorst — performing the gold fish bowl trick. In the top photo, *Chandu* waves his magic cloth over the bare table. Just below, he has passed the cloth completely over the teble, and is lifting off gold fish bowl. Note that teble appears unchanged. Anyone can perform this trick.

Here is how the trick is done. The dummy drepe is placed over the bowl, end the lower drape drawn up underneath the table. Lower and upper drapes ere exactly alike, making table appear empty. Under the concealment of the cloth being waved slowly over the teble, the upper drape is concealed in hand, lower drape released, and the fish bowl lifted off. Many hours of practice before mirror are needed.

REVEALS HIS *Magic Secrets*

Anyone can escape in a few seconds from this stout seck even though two pedlocks secure the eyelets at the top. In the ebove photo, *Chandu* (left) is assisting Harold L. Zimmer, euthor of this article, into the seck. *Chandu* then pesses a heevy iron rod through the eyelets et the top of the seck, and inserts pedlocks into holes in eech end of the ber. At right: The secret lies in the substitution of a two-piece rod, threeded skillfully together, which cen be sepereted through folds of the sack.

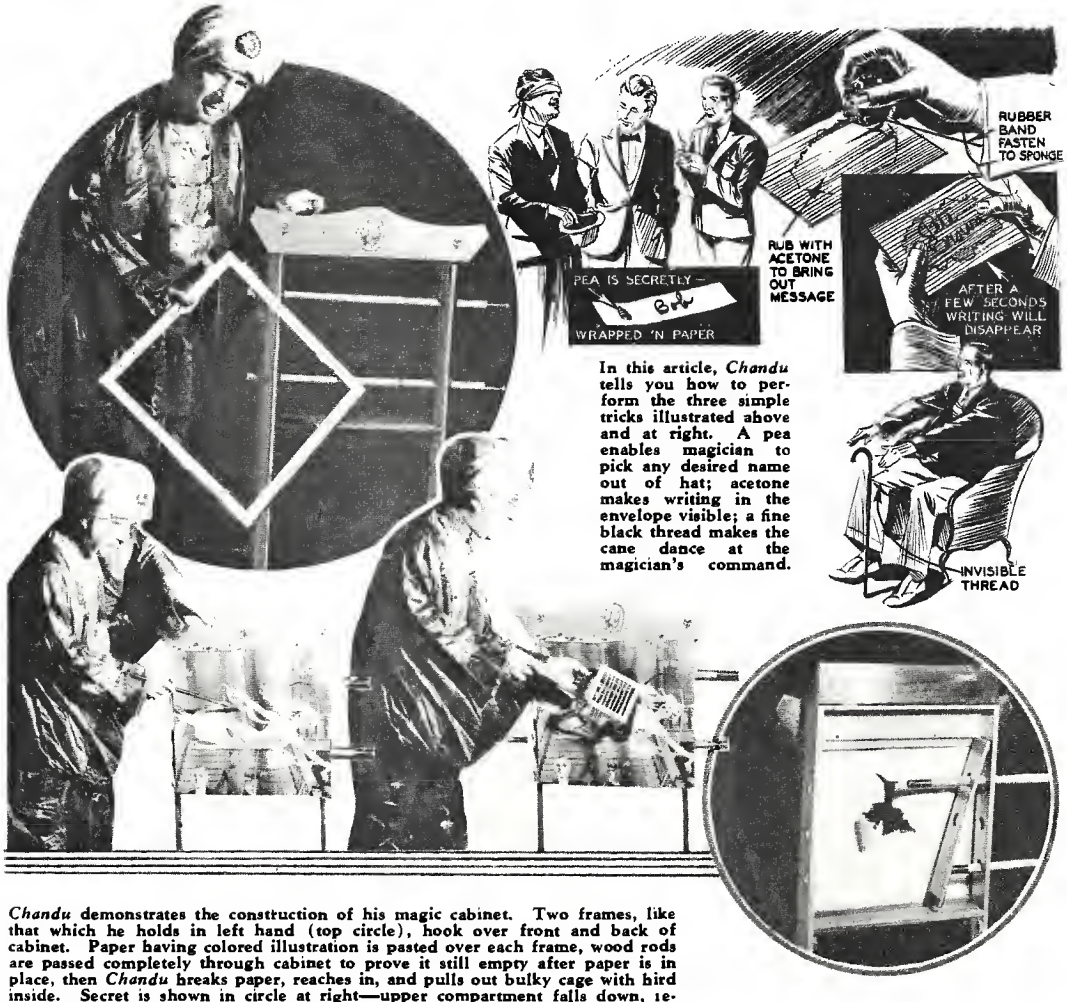
everyone agreeing that it *is* a sack. A solid metal rod, with holes in either end tó admit padlocks, is also passed about. A man crawls into the sack, the rod is slipped through rings at the top, and padlocks are snapped into each end. *Chandu* waves his cloth in front for a few seconds, and lo! the man has escaped. The sack remains locked—but empty. Keys? He didn't have any—and even if he had, he couldn't have worked even a finger through to use them.

Take two minutes and try to guess how it was done. Now—here's the answer: In the first place, there are *two* bars. They both look alike, even upon close inspection, but the *solid* one is passed around the audience. When the man crawls into the sack, the fake bar is slipped through the rings, and the padlocks snapped into place.

Behind the cloth screen, the imprisoned man reaches for the two locks through the sack. Twisting them in opposite directions separates the bar, as the two halves are threaded to fit together like a nut and bolt. In a second or two, he has stepped out and replaced the bar in its original position in the eyelets. However, even this simple trick depends on the magician's skill in palming the real bar and substituting the other before the eyes of his watchers.

Another trick which has long baffled theater audiences is the gold fish bowl illusion. A

BAFFLE FRIENDS WITH THESE MAGIC FEATS


RUBBER BAND FASTEN TO SPONGE
PEA IS SECRETLY — WRAPPED 'N PAPER
RUB WITH ACETONE TO BRING OUT MESSAGE
AFTER A FEW SECONDS WRITING WILL DISAPPEAR
INVISIBLE THREAD

In this article, *Chandu* tells you how to perform the three simple tricks illustrated above and at right. A pea enables magician to pick any desired name out of hat; acetone makes writing in the envelope visible; a fine black thread makes the cane dance at the magician's command.

Chandu **demonstrates the construction of his magic cabinet. Two frames, like that which he holds in left hand (top circle), hook over front and back of cabinet. Paper having colored illustration is pasted over each frame, wood rods are passed completely through cabinet to prove it still empty after paper is in place, then *Chandu* breaks paper, reaches in, and pulls out bulky cage with bird inside. Secret is shown in circle at right—upper compartment falls down, releasing folded bird cage, which springs out to full size when drawn out of cabinet.**

small, circular stand is displayed in the spotlight, bare except for a short, fancy velvet trimming around the edge. A single center leg supports it.

Chandu steps out, armed with only his magic cloth. No suspicious bulges are apparent about his person. He passes his cloth slowly over the table-top, whisks it away, and there before your startled eyes he is holding a large fish-bowl, filled with water and fish! How did he do it? He had nothing concealed on him. The table? Examine it. The short drape? Lift it up, look underneath it—nothing but an innocent table with a piece of velvet drape—apparently just like it was before he started.

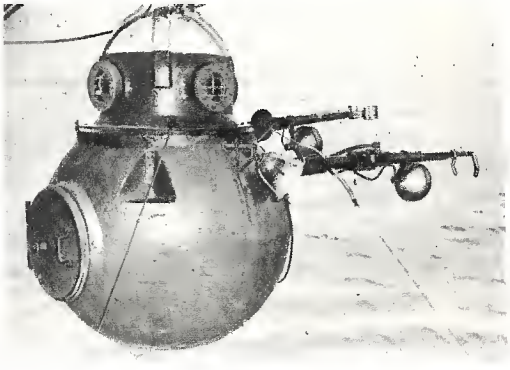
We say apparently—for it really isn't. If you were to measure it, you would find the table about four inches shorter than it was before. Have you guessed it yet? Well—there are *two* drapes, exactly alike. The one below is pulled up out of view with a string, much in the manner of an opera hat. Thus, the upper drape, hanging in a natural position, seems to be the only one. The flat top of the table, naturally, is bare. Now—*Chandu* sweeps his cloth over the table and pulls off the upper drape, which folds into a small parcel in his hand. Underneath, the bowl full of fish and water is resting on the *real* table top. He quickly picks this up, and moves away from the table. As he leaves, the lower drape clicks instantly down into place and the table looks the same as before. All this happens in a split second, while he passes his

[*Continued on page* 122]

Sunken Gold Lures Robot Divers

The treasure salvaging ship *Constellation*, shown above, is soon to sail the Spanish Main, carrying with her the diving robot with which to seek out the gold of sunken vessels.

"Thar's gold in them thar oceans," say these officials of the treasure hunting venture. From left to right—Capt. R. S. Reyall, M. C. Hardin, Lieut. H. E. Rieseberg, Ralph Fleming.



A side view of the Romano diving robot, showing the nine-foot hydro-pneumatic arms, delicate enough to pick up coins yet strong enough to lift half a ton. Note the arm lights.

ONCE more the world's richest treasure chest, Davy Jones' locker, is about to be invaded, this time by a weird, iron-clawed diving bell, the product of Eugene J. Romano's imagination and mechanical genius.

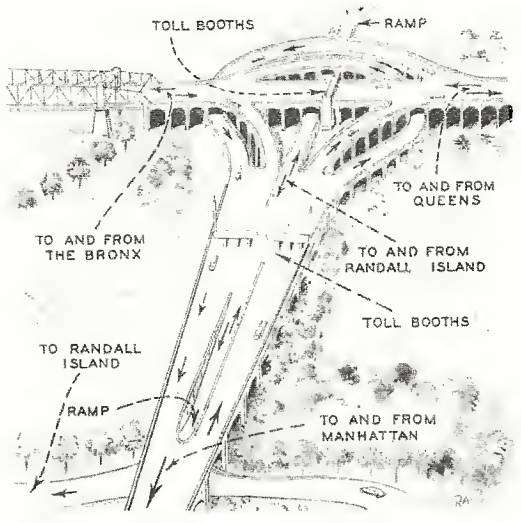
The Romano undersea robot, recognized by many authorities as one of the greatest advancements in deep sea operation history, has a pear-shaped shell capable of withstanding water pressure at depths of 5,000 feet. It has two arms nine feet long, strong enough to lift half a ton, and yet adjustable enough to pick up a small coin. There are powerful lights that can pierce the water for a hundred feet.

Oxygen for the operator is supplied by an apparatus inside the sphere working in conjunction with an air purifier. Unlike divers who plumb the depths in diving helmet and suit, the operator of the robot works under normal pressure regardless of the depth.

In salvaging sunken treasure, the robot will be hoisted over the side of the salvage vessel *Constellation,* and a mile long cable will lower it to the bottom. There the operator will guide the ship's movements by telephone until the sunken treasure ship is located.

A Romano salvage buoy, capable of raising 100 tons, will be lowered. This buoy permits the water to flow through it, thus equalizing the pressure. The operator, manipulating the hydro-pneumatic arms of the robot, will then rig the buoy in place. Pumped-in air will replace the water in the buoy and raise the boat.

Cross Traffic Lanes Inter-Woven On Multi-Layer Bridge



This artist's sketch of the Triborough Bridge, New York, to be completed next year, illustrates the manner in which traffic will be guided, no two lanes crossing on the same level. It will solve one of New York's biggest traffic problems.

LIKE a giant roller coaster the Triborough Bridge of New York, to be opened to the public in 1936, will have 12 lanes of traffic dipping and circling one above the other without confusion in one of the most ingenious solutions of the heavy traffic problem yet to be devised.

Motorists from Manhattan, wishing to make a left turn on the bridge to reach the Bronx, will swing to the right, dip beneath cars going to or coming from the Queens, and then circle up and to the left, passing above Manhattan bound traffic and emerging on the bridge crossing to the Bronx. To turn right for the Queens, the Manhattan motorist continues past the Bronx bound traffic lane and then makes a simple left turn.

This same system, with minor variations, applies to the other approaches except that from Randall Island, beneath the bridge, straight ramps permit the entrance and exit of cars. All the traffic lanes will be plainly marked. At no place on the bridge will two lanes of traffic cross on the same level, and the only check to the flow of cars will be a slight pause at the toll booth.

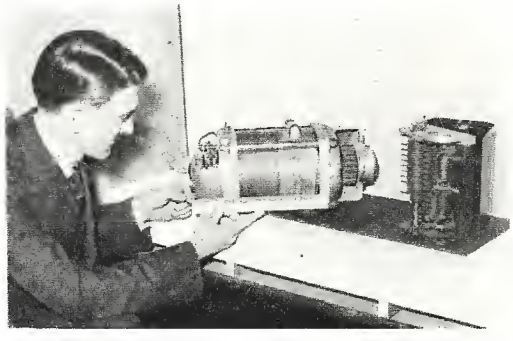
Most Prolific Inventor Retires

JOHN R. GAMMETER, the inventor who has been awarded more patents than any other person in the United States, has retired at the age of 50.

Mr. Gammeter began his professional career as a plumber, and failed in two years. Next he became a wheelbarrow pusher in an Akron rubber plant. It was there that he first showed his inventive genius, inventing a trimmer for rubber bottle stoppers. Since that time he has invented hundreds of devices, from dripless hot dogs to dirigibles.

Hunting and fishing will replace inventing for John Gammeter, shown with his dogs. He retired et the age of 50 a short time ago, after having received more than 250 patents.

First Self-Starter Now Antique



Only 18 years old, and already a museum piece—that is the fate of the first self-starter, shown being put on display at Smithsonian Institution. The starter switch is on right.

IT WAS less than 20 years ago that the first automobile self-starter was placed on the market. Costing $350 at that time, the device was scoffed at as an impractical luxury. The ponderous device recently became a museum piece in the Smithsonian Institution, where it serves to illustrate the progress in automobile mechanics.

To operate the original starter, a huge and complicated switch was necessary. The drain on the battery was enormous.

MICROSCOPE SHOWS MECHANICS of a BUTTERFLY

The mechanics of a butterfly's flight is revealed by studying the wings with and without scales. A section of a wing, held on a glass slide, is being brushed with an artist's paint brush in the above photo, to remove the fine scales.

Wings of butterfly, *Polia Laudabilis*, magnified 34 times, shown with scales (above) and without scales (at left).

Under high magnification the structure of a butterfly wing scale is revealed. The above scales are magnified 100 times, and show the grain pattern which, though colorless, reflects as well as absorbs light rays to give illusion of bright colors.

by **JULIAN D. CORRINGTON, Ph. D.**

YOUR microscope is a gateway into nature's fairyland, where the secrets and mysteries of reptiles, birds, and mammals are unfolded in a blaze of color. On this microscope-journey you will study the mechanics of flight, and learn how the butterfly, nature's most beautiful pilot, flutters from flower to flower and soars aloft on vagrant breezes.

Catch several butterflies of the same kind and bring them in to your workshop, killing them by pinching the thorax or by using a cyanide jar. Choose a species of small size so that a complete wing may be mounted on a slide. The wings of a butterfly or moth are covered with a multitude of minute scales, arranged like shingles on a roof, and since these come off upon the finger like fine powder at the merest touch, handle the wings only with instruments.

Remove a given wing—let us say the right forewing—by cutting with scissors at the extreme base, and transfer it to a slide with forceps. Treat with 95% alcohol and then xylol for ten minutes each, then mount in balsam and store in a flat position until the slide has hardened.

Now take a right forewing from another individual of the same species of butterfly, and with a small brush of medium-stiff bristles, as an artist's paint brush, slowly and carefully remove all of the scales from both surfaces. A dull knife blade, held vertically, will also serve. The membraneous wing itself should not be torn or mutilated in this process, and several attempts may be required for perfect results. Mount this second wing on another

[*Continued on page* 140]

Electric Glove for Police Stuns Victims With 1,500 Volts

This glove looks innocent, but any criminal tapped on the shoulder with it would get a 1,500-volt shock. The inventor, Cirilo Diaz, is shown wearing the glove and small battery.

MORE punch than can be found in a box-glove is contained in a new electric glove invented by Cirilo Diaz of Cuba for use by police while handling rough characters or in quelling riots. Persons contacted by an officer wearing the glove receive a 1,500-volt shock, sufficient to remove all traces of fight. A half-pound battery worn on the belt supplies the power, all wiring being concealed beneath the coat.

Police officials in New York where the device was first demonstrated, were favorably impressed by its effectiveness.

Astrology Goes Coin-In-The-Slot

THE ancient astrologists who spent weeks in studying the stars to cast a horoscope would be amazed at the 1935 electric coin-in-the-slot astrologer which delivers a forecast at the drop of a coin. To determine the supposed influence the stars will have on his life, the operator merely plugs in on his birth date. From the hundreds of cards within the highly intricate mechanism then selects a card corresponding to the date, promptly delivering it through a slot.

Electricity is used in the operation of the mechanical astrologer.

This electrical astrologer delivers forecasts when the operator plugs in his birth date on the calendar and drops coin in indicated slot.

Motor Unicycle Proves Fast, Safe

A SPECTACULAR demonstration of unicycle operation was given in Los Angeles recently when Walter Nilsson, California inventor, drove his specially constructed machine 18 miles per hour in second gear without the aid of a pneumatic tire.

His unicycle consists of a single outer wheel driven by an inner wheel held in a stationary frame and powered by a one-cylinder motor. The engine is mounted motorcycle fashion between the rider's legs. Steering is accomplished by means of a secret device which tilts the outer wheel while permitting the rider to remain upright.

With the arrival of a pneumatic tire, Nilsson expects to be able to attain 100 miles per hour.

High speeds with perfect safety are claimed for this gravity defying unicycle. Waltar Nilsson, the inventor, is shown at the wheel of his machine after a conclusive demonstration.

New York's TRAFFIC Speeds On SKYWAY

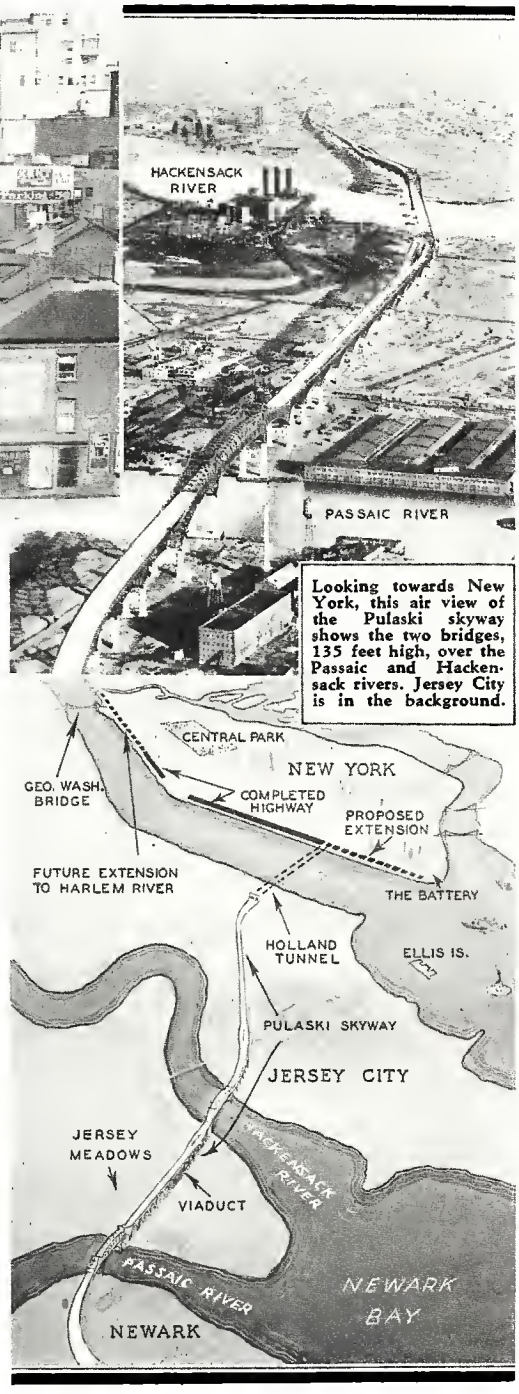
View of a completed section of the Miller Elevated highway on New York's West Side, which is to extend from the Battery to the north end of Manhattan Island. Motorists will be able to travel the length of the island in twenty minutes.

LINK by link New York City, on the most congested island in the world, is becoming a metropolis of elevated highways, motoring skyways which cut traveling time in half and reduce dangers from cross traffic to zero.

The latest development is the Miller Elevated Express Highway for automobile traffic, six lanes wide, and, when completed, extending from the Battery to the north end of the island. Three miles of the skyway, skirting the Hudson River from Canal to 72nd Street, have been completed, with the remainder scheduled for completion by 1938. The total distance is 13½ miles, and the estimated cost is $50,000,000. Plans are now under way to encircle the entire island with the highway.

The span now in use absorbs an average of 22,851 cars between 7 a. m. and 7 p. m., freeing the surface streets of that excess burden. Estimates place the number of cars that will use the completed highway at 75,000 every 12 hours. The driving time for the length of the island will be reduced by a full hour.

Traffic flowing into New York from the west and south passes over another great skyway, the Pulaski Highway, longest viaduct for motorists in the world. This crosses the New Jersey swamps, then rises above the Passaic and Hackensack rivers at elevations of 135 feet, passes through Jersey City, dips through the Holland tunnel, and emerges on the Miller Highway.



Looking towards New York, this air view of the Pulaski skyway shows the two bridges, 135 feet high, over the Passaic and Hackensack rivers. Jersey City is in the background.

Connecting with the Holland tunnel, the Pulaski skyway forms one of the main arteries feeding New York's traffic streams. Its great viaduct over the swamps between Jersey City and Newark is the longest in the world for motorists. On its wide, elevated roadway drivers can safely make the trip between Newark and New York in half the surface time.

MAN WILL *Migrate*

Poultry of the future, through the application of synthetic hormones, will attain enormous size, and hens will lay eggs the size of footballs.

Through the advancement of science, people may live at any desired age indefinitely. Grandfather, father, and son may share their youth together for hundreds of years.

WITHIN the next century many discoveries will be made. Natural laws we believe in today will be contradicted; new ways of living will be necessary.

I am giving here specific examples of what is probable in 2035, one hundred years from today.

The greater strength and lightness of the materials of construction of the future will develop increased speeds and safety of transportation. Like the return of prosperity, the thousand-mile-an-hour airplane is "just around the corner."

Engineering is already waiting for chemistry to give it a fuel capable of releasing more energy per pound than is required to lift that pound out of the earth's gravitational field. Given such a fuel, interplanetary travel will become a possibility. Gasoline, explosives, or other materials which depend on combustion for their release of energy fall short of this requirement —so much so that a really new magnitude of energy storage must be sought. This perhaps may be found in radio-activity.

So far, the inability to control or direct such energy liberation prevents its utilization for the purpose at hand, but within the next century this difficulty should be overcome. It would seem that some form of

Each wave, crashing through this inlet to the Ethyl-Dow Co. bromine plant, brings hundreds of dollars in unclaimed wealth from the sea. It is estimated that in one year, $50,000,000 in chemicals, including $20,000 in gold passed the gates. Wealth of future will come in this manner.

to Mars

The great strides of science today are but tottering steps compared to future progress says Thomas Midgley, above, vice president of the Ethyl Gasoline Corporation, and holder of the William H. Nichols medal for work in science.

by **THOMAS MIDGLEY**

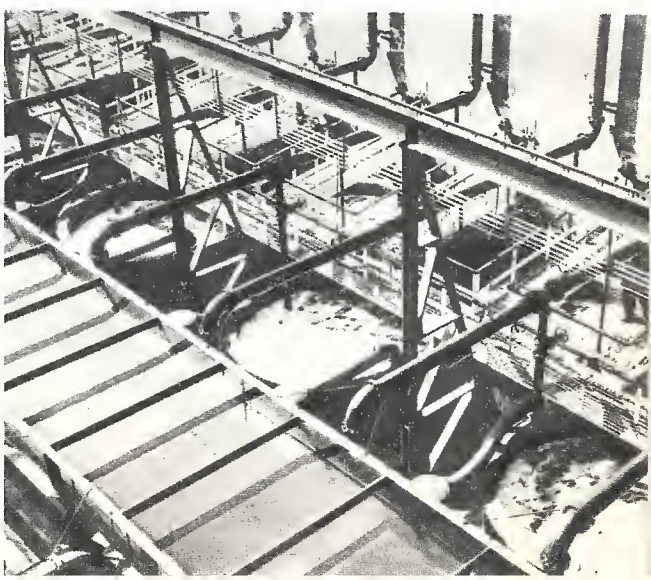
Vice President, Ethyl Gasoline Corporation

Rocket ships flashing like meteors through the sky, life that defies time, wealth from the sea, animals ten times their present size—these are but a few of the possibilities suggested by Thomas Midgley, in his predictions for the year 2035 based on the scientific developments of today.

synthesis of elements (or their equivalent) of the proper active type would be the logical line of attack. Be this as it may, the major premise is that within a century the chemist will offer to the engineer a "fuel" capable of releasing in useful form more energy than will be required to lift itself through the earth's gravitational field. This, in a short while, will result in making interplanetary transportation possible.

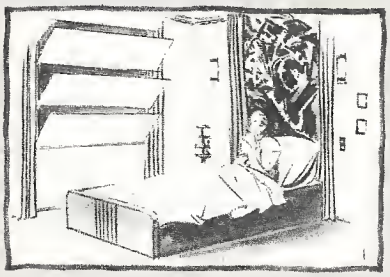
I should not care to give the impression that interplanetary transportation will become commonplace immediately. Considerable preparation of environment will be necessary. Mars will need water, Venus a new atmosphere; all of this will mean work for the future chemists and engineers and, after all, why should we not leave something to be accomplished in the century after next?

The distortion of economics which exists at present in agriculture makes it difficult to interpret properly the future of chemistry in this field. I have heard this economic distortion described as a condition wherein we grow more corn to raise more pigs to make more fertilizer to produce more cotton to plow under. Such a condition is so contrary

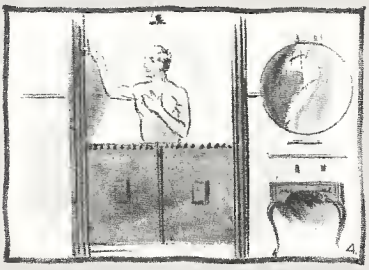


From the sea water pumped into these vats at the Kure Beach, N. C., bromine plant, bromine used in the making of ethyl gasoline is extracted. Gold, magnesium, potassium, and other valuable metals and chemicals may be extracted from similar vats.

SCIENCE HASTENS TOWARDS A LUXURIOUS FUTURE



1. That tired feeling in the morning will still be with us in 2035, but a "wake producer" pill will soon banish it, according to Midgley. 2. A button will close the windows and fill the room with warm air carrying just the right amount of moisture. The hour for arising will seldom be before 10 a. m. The room furniture is made of new materials which adjust themselves to room temperature.



3. Laundry bills will drop to zero a hundred years hence. The first thing one will do on arising will be to dispose of the cellulose pajamas. The cost of the waste cellulose textiles will be even less than the present price of paper. 4. Next comes the shower, automatically adjusted to the proper temperature. Mixed with the spray will be fungicides and germicides to insure absolute cleanliness.

5. Tooth brushes will be ancient history in 2035. Instead, one will use a medical preparation which dissolves all foreign matter in the mouth. It will also act as a gum stimulant. 6. Then comes breakfast. In this matter it will be a question of personal choice, one being able to order a few pills of concentrated food or fresh produce straight from the scientifically controlled farms within a few minutes of city.

to the established rules of progress that it cannot continue very long.

If I am wrong in this belief and crop curtailment continues as a permanent necessity, I feel justified in making the following prediction: The chemist will eliminate the bureaucracy by increasing the amount of ozone in the earth's atmosphere, thereby limiting the ultraviolet radiation available for agriculture to the amount required.

The direct synthesis of the carbon—hydrogen bond from carbon dioxide water, and sunlight will become an accomplished fact. Such a development will take place on swamp and submarginal lands where the basic raw materials are as readily available as elsewhere and will result largely in the production of organic raw materials for further synthesis in the chemical factory.

In the field of animal husbandry great changes will result from the application of synthetic hormones to promote growth. This will make possible a much greater and more rapid meat production from a given amount of foodstuff. In other words, a century hence, chickens will be the size of pigs and lay football sized eggs, hogs will be the size of cattle, and bulls will be mastadons; yet the food consumed will be no greater than that used at present.

Expected future events under health are multitudinous. A few of the more obvious are as follows:

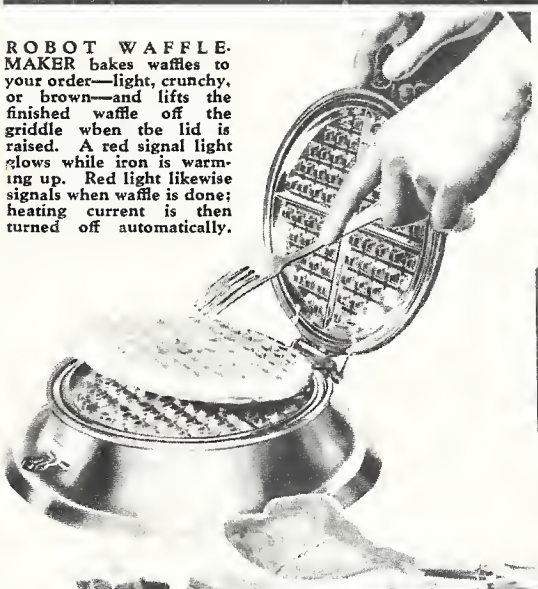
The understanding of the chemistry of cancer and its resulting control.

The elimination of cold and influenza epidemics by a knowledge of the basic chemistry involved.

The exposure of the chemistry of the teeth, leading to a relatively simple and effective hygiene for their proper preservation.

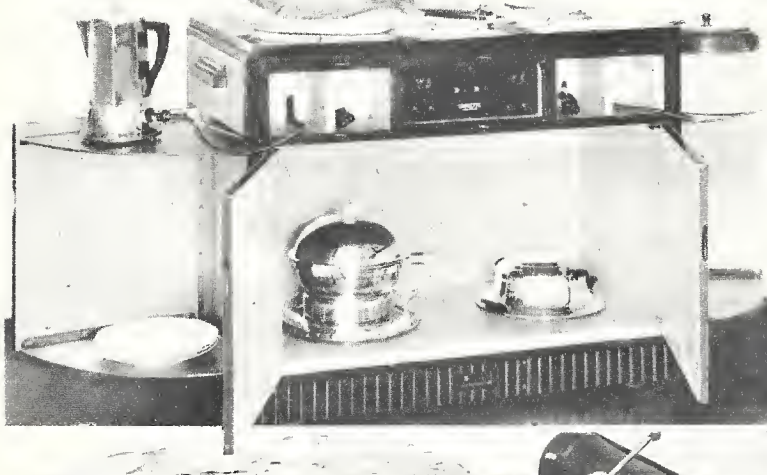
[*Continued on page* 134]

CUP-WEIGHING SCALE Among New Work-Savers

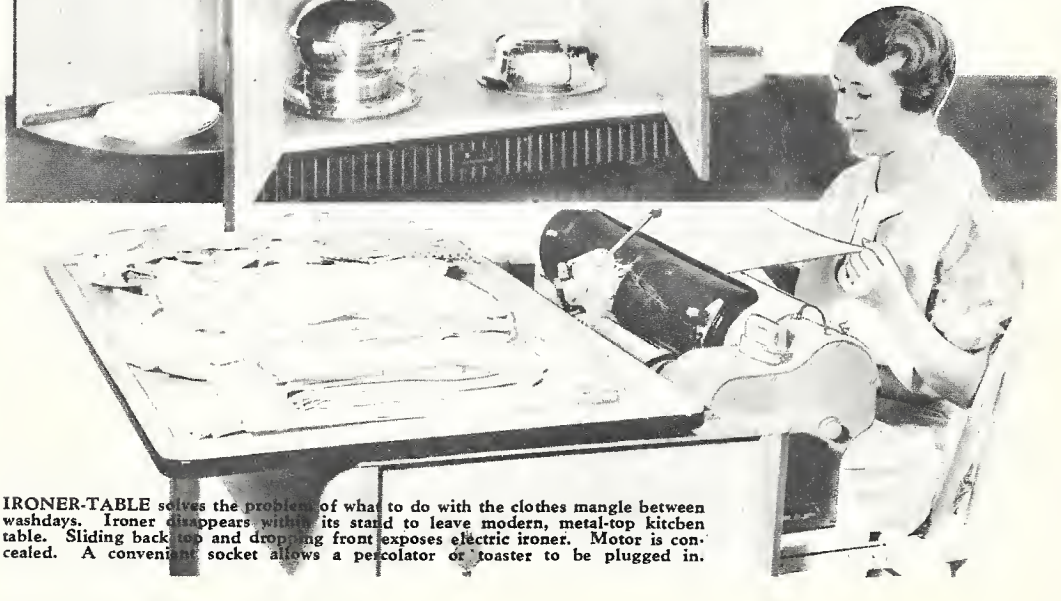


ROBOT WAFFLE-MAKER bakes waffles to your order—light, crunchy, or brown—and lifts the finished waffle off the griddle when the lid is raised. A red signal light glows while iron is warming up. Red light likewise signals when waffle is done; heating current is then turned off automatically.

KITCHEN CUP-MEASURING SCALE makes baking an exact science. Dial with colored bands for each ingredient weighs in cups of lard, sugar, flour, etc., as well as in ounces. The entire dial can be turned until the pointer is on zero for the empty pan, to offset the weight of measuring dish used.



PORTABLE ELECTRIC COOKING TABLE makes possible the cooking of meals on the lawn, the porch, in the sick room, or at any other place where a single electric socket is available. Outlet cords and sockets supply current for different appliances.



IRONER-TABLE solves the problem of what to do with the clothes mangle between washdays. Ironer disappears within its stand to leave modern, metal-top kitchen table. Sliding back top and dropping front exposes electric ironer. Motor is concealed. A convenient socket allows a percolator or toaster to be plugged in.

First Aid Stations Housed In Street Telephone Booths

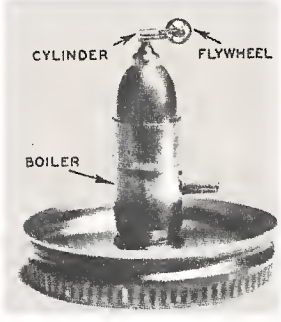
Fully supplied with all the equipment necessary to administer first aid, emergency stations like the one ebove have been established in telephone booths on Berlin's street corners. The wheeled stretcher folds into tiny compartment below telephone.

STREET corner emergency stations housed in telephone booths are now being established in Berlin, Germany, as the latest means of combating accident fatalities. The stations can supply anything from a bandage for a finger wound to a full-sized stretcher and medical kit for serious traffic accidents.

To obtain first aid equipment it is only necessary to go to a booth, located on the street, and insert a coin in the designated slot, the size of the coin being determined by the severity of the accident and the amount of equipment necessary.

The supplies are packed compactly in the lower part of the booth, which continues to perform its original function of a public telephone booth. The wheeled stretcher, tightly folded, is kept in a special partition, together with the medical kit that goes with it.

Match Flame Powers Steam Engine

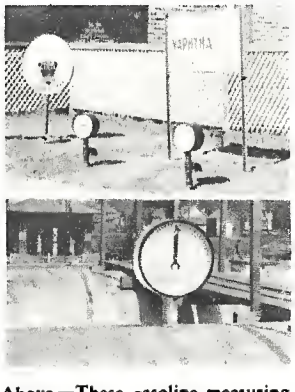


A .45 celiber shell provides the boiler for this tiny steem engine weighing only 1/170th of en ounce. It can make 15,000 r.p.m. on the steam created by e match.

A STEAM engine so small it would take nearly 3,000 of them to weigh a pound has been made by a jeweler in Texas. It is mounted on its boiler, a .45 caliber shell, and has a flywheel .181 inches in diameter. A match is used for fuel.

Meter Measures Buried Gas Tanks

GASOLINE or distillate in underground tanks, may now be measured accurately by a recently patented meter operated by a metal float placed in the tank and connected to the meter by cable. Different sized cable drums are used on different types of tanks.



Above—These gasoline meesuring gauges eliminete the need for poles in meesuring the contents of underground tenks. Below—The gauge installed on a bulk tank.

Micro-Spectacles Leave Hands Free

The microscope-spectacles, as worn by girl on left, heve proven superior to hend magnifying glasses and at the same time allow the operator full use of both hends. Light is focused by lenses on surface to be examined.

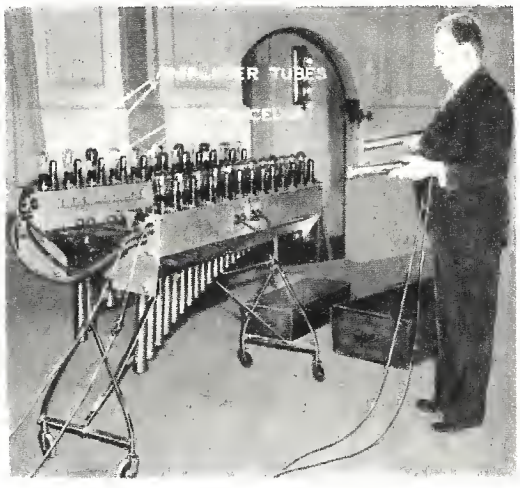
ADJUSTABLE lenses mounted on spectacle frames have been developed in Germany to replace low powered hand microscopes for use by doctors, laboratory workers, beauticians and others who require both hands for close work.

The special lenses have a convexity, and dimensions are such that all the light is concentrated on the surface being examined.

Flashlight Beams Make Music On Photo-Electric Marimba

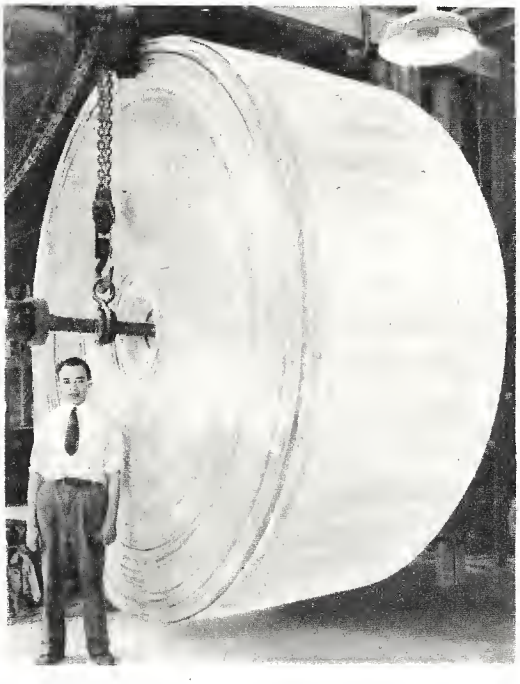
MODERN electronic engineers duplicate the music of a primitive marimba band with light beams, photo-electric cells and radio tubes. Dr. Phillips Thomas of the Westinghouse Research laboratory recently demonstrated a "light music" instrument which played by waving flashlights held in each hand.

Dozens of photo-cells and radio tubes are lined up side by side atop the new musical device. For each musical note there is an oscillating circuit which produces electrical vibrations when light is directed on that circuits photo-cell. Reproducers convert the electrical vibrations into sound which is directed into the marimba pipes.



Dr. Thomas plays the photo-electric marimba by directing flashlights held in hands on different photo-cells. Each amplifier tube produces and amplifies one musical note.

Giant Belt Is Quarter-Mile Long



This conveyor belt, one of world's largest, weighs 11 tons.

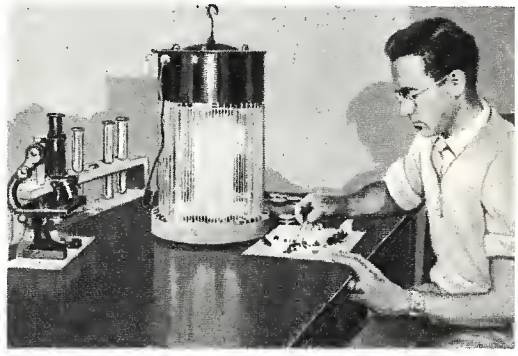
MORE than 16 bales of raw cotton and 5,000 sq. ft. of tough rubber were used in the construction of one of the world's largest belts, 1,291 feet long and 4 feet wide, at Passaic, N. J. The belt will deliver 1.500 tons of crushed limestone an hour.

It is made of 7-ply heavy duck, reenforced on top with a quarter inch layer of rubber and on the bottom with a $\frac{1}{16}$-inch layer.

Lamp Attracts, Electrocutes Flies

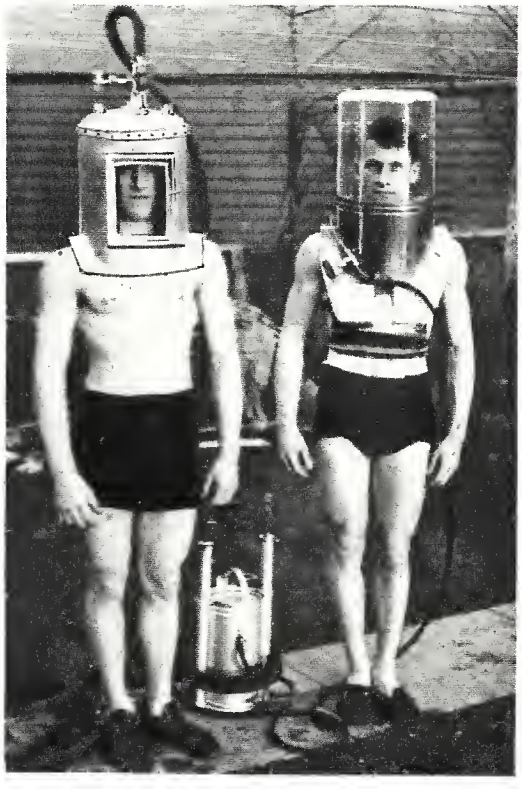
USING colored lights to lure insect pests into his electrocuting machine, Prof. W. S. Herms of the University of Southern California has prepared a complete table showing just what colors are preferred by each type of insect pest.

His killing lamps are now in use in fruit-packing sheds, mushroom caves, canneries, and orchards. Different lights are used in each installation to lure one particular type of insect. Insects seeks to reach the coiled luminous tubing brush against closely spaced wires charged with electricity and are electrocuted. In one test on mosquitoes, several pounds of the insects were killed within the space of a few hours.



J. K. Ellsworth of University of Southern California examines insects killed in three minutes by this cage-like electrocuting lamp. Bright orange light is preferred by houseflies.

Glass Cooky Jar Becomes Diving Bell



Joe, left, and Jerome Maurice, Fond du Lac, Wis., are shown above with their home made diving helmets. The glass helmet was made from a cooky jar and sheet copper.

DIVING enthusiasts for more than a year, the twin brothers, Joe and Jerome Maurice, 17-year-old high school students of Fond du Lac, Wis., invaded their mother's pantry for their 1935-version diving helmet.

A heavy glass cooky jar was selected to form the bell of the helmet, and thick sheet copper was sealed to this to form the breast plates and shoulder supports for the jar.

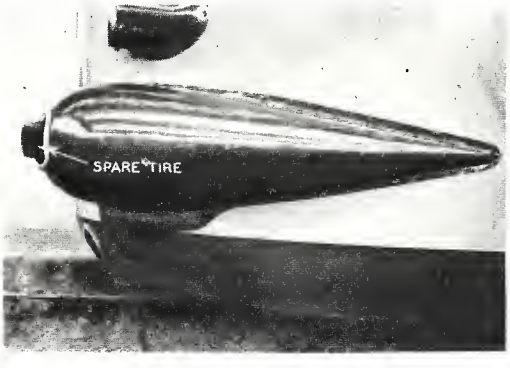
Several improvements in construction were added to the new model. The air valve was placed within easy reach of the right hand, with the air hose entering the helmet from below to prevent kinking. The helmet may be swiftly slipped off in the event of accident below water.

The greatest advantage of the cooky jar diving bell is that it permits full vision in all directions with ample safety. Air is supplied through a two-cylinder pump at a pressure of 30 pounds per square inch. At a depth of 35 feet, the helmet functioned perfectly.

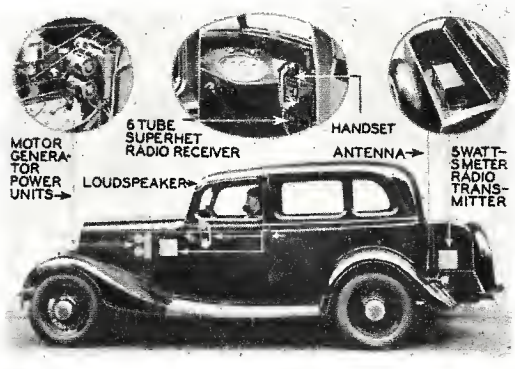
The helmet the twins used in 1934 was made from the end of a water tank, with a top air valve and welded port window for observation. The imperfections of this helmet led to the invention of the new one.

Spare Tire Is Rail Car Bumper

CARRYING out the streamlining of a new French rail car, the spare tires have been inserted in the buffer chambers. The pneumatic tires make excellent bumpers, and also accentuate the design.



Projecting slightly from the buffer chamber of a French rail-car, this pneumatic tire adds to the streamlining of the novel car, while serving as both the bumper and the spare tire.



The above illustrates the manner in which the two-way radio-telephone equipment operates. The antenna projects above the back of the car, with the transmitter in the trunk.

Radio-Telephone Aids Police

MOTOR PATROLMEN, through the latest development in police communication, perfected by Bell Telephone laboratories, can now carry on a two-way conversation with headquarters without leaving their cars. The radio car transmitter weighs but 20 pounds, has a power of 5 watts, and is crystal controlled. The sound of the patrolman's voice automatically puts the transmitter on the air.

Flying Camera Seeks News Photo Scoops

Above—Plane used by the *Detroit News* to secure aerial photos. Note the bullet-shaped compartment which houses the wing camera. Pilot controls camera from the cockpit.

Above—James V. Piersol, editor-pilot who adapted cameras to plane, looks through finder in cockpit. Two other cameras are located in floor and tail for securing angle shots.

A MACHINE-GUN aerial camera, streamlined into an airplane wing, is one of the features of the Detroit News' recently acquired "flying newspaper office." With the new camera-equipped craft, it is now possible to obtain bird's eye views of huge fires, floods, riots, etc., so that early editions may contain news pictures which "scoop" rivals.

James V. Piersol, aviation writer and pilot, supervised the special installations in the speedy Wasp-motored Lockheed Orion monoplane. The wing camera, which can shoot as many as 110 exposures every two seconds with a single loading, is housed in a bullet-shaped compartment inside of the wing. It can be loaded or unloaded easily from the ground.

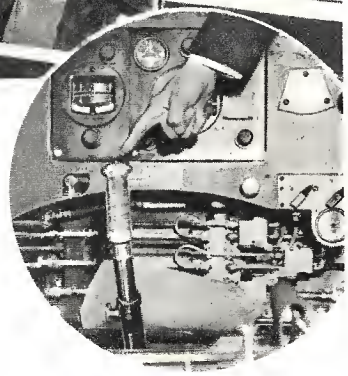
The finder of the camera consists of a machine-gun sight mounted in front of the pilot's seat. When taking a picture, the pilot puts the plane into a glide, secures the desired composition through the finder and presses the release button atop the control stick, thus snapping the shutter. In this way the pilot is able to photograph at will without removing his hands from the controls.

Two other news cameras are located at strategic points on the plane. One is mounted in the floor of the cabin and can be operated by a passenger-photographer. Another is placed farther back in the ship. This is capable of shooting upward, to either side or to the rear of the plane so that pictures can be taken at any desired angle.

The cabin also contains three passenger seats, a portable typewriter desk for radio operator or reporter, a radio transmitter for broadcasting outdoor events and a Sperry automatic pilot for relieving the plane's pilot.

Right — Unloading magazine from wing camera. As many as 110 exposures can be made with one loading. The wing camera is capable of taking pictures of news events from air at two-second intervals.

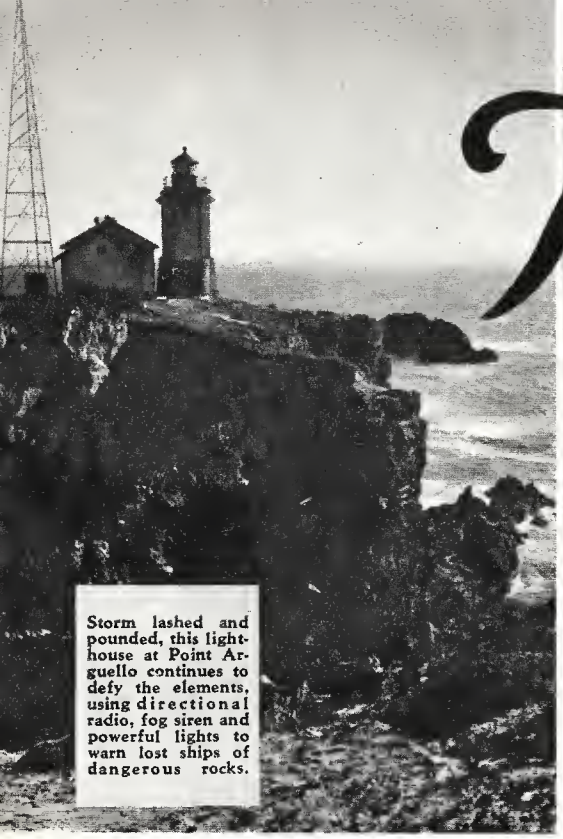
Above—A sliding panel out of the radio cabinet serves as a typewriter table. The desk may also be used by a radio operator when the flying reporter is not writing copy.



Circle—Note camera release button on the top of the control stick which permits picture-taking without moving hands.

Thrilling OF THE

by JAMES BOWLES



Storm lashed and pounded, this lighthouse at Point Arguello continues to defy the elements, using directional radio, fog siren and powerful lights to warn lost ships of dangerous rocks.

"POINT ARGUELLO — Point Sur— Los Angeles," sang the radio in dots and dashes.

Three operators in these lonely outposts, guardians of ocean traffic along California's rocky and treacherous shore line, huddled before their receiving sets.

"Arguello—Sur—Los Angeles," came the message again. "Where am I?"

As the unnamed ship broke off, the three operators jumped into action.

"Press down your sending key," ordered the Pt. Arguello operator. "We'll find you."

At each station a lighthouse keeper, expert in radio, lights and meteorology, swung his directional antenna until the signal sang strongest in his ears.

Keeper Tom Henderson at Pt. Sur, 300 miles north of Los Angeles, and Keeper I. D. Conklin at the Los Angeles lighthouse, speedily radioed to Keeper George Bosworth at Pt. Arguello, mid-way between, the direction from which the messages had come. Bosworth traced the two lines on a plotting board, added the line from his station. Strangely, all ran inland, and not out to sea.

He examined the map, moved his hand to the sending key.

"Bearings show you are alongside dock at Richmond, California," sputtered his message to the ship's skipper. "Anything else?"

And with the clearing of the fog, the astonished captain found he had blundered his way to his own dock. The radio bearing had proved uncannily accurate.

Every month some of the three-score light-

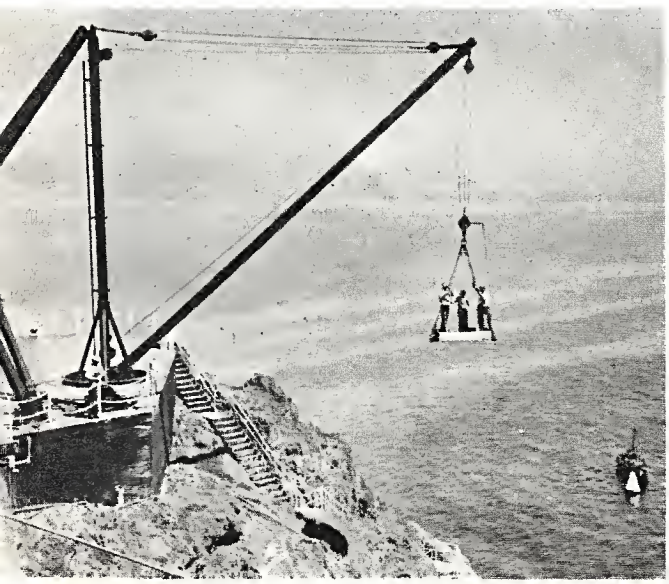
Photos by Conklin

A single rock in the Pacific forms the base for the solitary Miles Rock lighthouse. Her friendly beam is a welcome and warning to ships sailing for California's Golden Gate.

Rescues
LIGHTHOUSE KEEPERS

Piercing both fog and storms, this million candle power light at Los Angeles lighthouse can be seen for miles under the most adverse weather conditions.

The guardians of the coast combine spectacular heroism with modern science to ward vessels from the graveyards of the sea. Their methods and some of their thrilling rescues are told in this article of hardship and courage during storms.



This "elevator" for the lighthouse keeper at Anacapa Island, off the coast of California, rises 180 feet from sea level to a loading platform at the edge of the cliff below the tower.

house crews along the Pacific coast perform miracles of science or physics to save lost ships and distressed crews. Theirs is a little-sung saga of protection for ships plying the Pacific, made more effective recently by the addition to the lighthouses of directional radio apparatus, fog-piercing lights and two-tone fog horns that can be heard beyond the horizon.

The other night a ship crept cautiously toward Los Angeles harbor in an impenetrable fog which had hung over the ocean for three days. Anxious to verify his position before reaching the breakwater, which extends like a finger of rock two miles out into the sea, the captain turned to his radio operator for a comparison of fog-horn signals and radio signals.

He knew the station blew its fog horn and started sending its call letter simultaneously after every silence period. Since radio signals travel with the speed of light—586,000 miles a second—while sound "crawls" at a mere 1,100 feet per second, he started a stop watch when the first radio flash came through and stopped it when he heard the mournful tone of the fog signal. Multiplying the number

E OUTPOSTS GUARD SEA TRAFFIC

of seconds by 1,100, he arrived quickly at his distance in feet from the dangerous rocks—in this case 12,100.

Recently the lighthouses along the west coast have added a new signaling device—one that actually shouts a "yoo-hooooo." This is known as a diaphone. It emits high and low notes and works like an air hammer. The S. S. Talamance reported hearing the "yoo-hoo" through 20 miles of fog.

Now the lighthouse service is installing another sound device, a small transmitter which sends out a warbling note, heard only two to five miles distant. This warning goes on the air via radio at frequent intervals when the regular broadcast is silent, and informs any straying ship of its dangerous proximity to rocks or shore.

Anywhere along the coast these little-

[*Continued on page* 130]

Upper left—The lighthouse crew at St. George's reef is shown here hoisting a life boat to its dock 50 feet above the sea. Circle—This is the world's most costly lighthouse, built on a foundation of interlocking rock on St. George's reef at a cost of $750,000. Below—The light ship Relief is permanently anchored on San Francisco bar to serve as an off-shore lighthouse. Note the lights mounted on the masts, the radio equipment, fog horn, and warning bell.

At the end of a 2-mile long finger of rock jutting into the sea stands the Los Angeles lighthouse. During storms the base of this tower is submerged in waves, and three times in one month ships struck at her foot. The radio has guided scores of fog-bound ships past the rocky shoals and into the harbor.

Giant 18-Wheel TRUCK Hauls 18 Tons

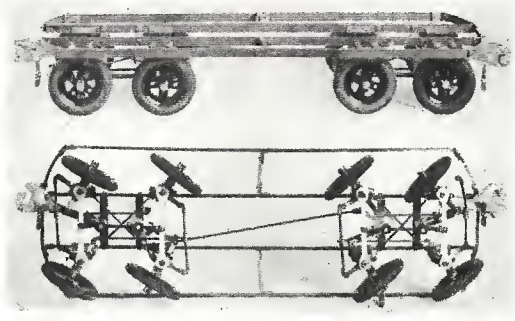
A STREAMLINED gasoline truck 50 feet long and with a gross weight loaded of 62,000 pounds has proven successful in making long distance deliveries in Kansas and Colorado. For even distribution of the enormous load, 18 wheels are needed, the front six of which are drive wheels.

The truck has five speeds ahead, and one reverse, with the sliding jaw type of transmission operated by a single lever. Because of the short wheelbase of the tractor, the ease of maneuvering the unit has proven surprising.

The maximum load capacity of the unit is 5,800 gallons, or 18 tons. It has a 125 horsepower engine, and air brakes for the six front wheels, permitting plenty of speed and an ample margin of safety.

As long as the average freight car, this streamlined gasoline truck is used to make deliveries in sparsely settled areas. The 18-ton load is distributed evenly over each of the 18 wheels.

Trailer Device Cuts Side Sway



The double trucked trailer shown above eliminates side sway through an arrangement of tie rods and connecting rod operating on independently mounted wheels as shown below.

AUTOMATIC realignment of the wheels after negotiating curves, and independent wheel mountings are two safety features contained in a new double trucked trailer of Canadian invention.

By means of an arrangement of tie rods on both trucks, and a connecting rod between front and rear, the rear trucks are caused to turn in the opposite direction of the front trucks when making turns, thus eliminating dangerous side sway. This arrangement also permits the trailer's being turned in a complete circle in just a little more than its own length.

Complete stability of the unit is assured by the independent mounting and springing of the eight wheels. Several trailers of this type can be linked together with none of the curve and road hazards formerly encountered when hauling more than one trailer.

Science Will Aid Sail Boats

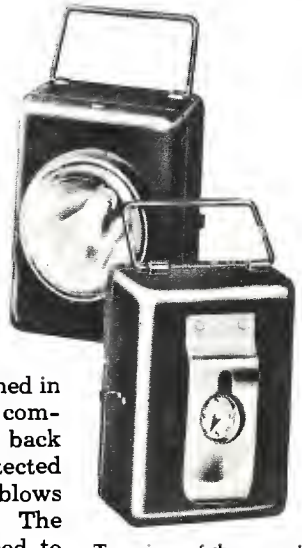
DEFYING the belief that sailing ships have outlived their commercial usefulness and now are a thing of the past, J. M. Hammond, Jr., an inventor, is now experimenting to prove that sail boats can be developed to steamship efficiency.

Deficiencies in the old style sails, which have changed but little in the past 200 years, are brought to light by high speed motion pictures of miniature sails placed in a wind tunnel. New sail designs will be tested by the inventor in the same manner.

Hammond will give the successful designs actual tests on a 120-foot auxiliary schooner.

Camp Lantern Contains Compass

A STURDY electric camp lantern carrying a compass mounted in the back has been put on the market to meet the demand of hunters, tourists, fishermen and other outdoor enthusiasts. The case is made of brass durably finished in khaki color. The compass is inset in the back where it is protected from accidental blows by the belt clip. The light can be focused to any desired area.



Two views of the general purpose lantern, showing compass mounted in back.

French Lorry-Train Speeds Freight

Through dual purpose trucks such as ere shown ebove, the French Stete Reilway system hopes to be able to furnish scheduled freight service to ell communities now reached only by truck. At the left the lorry-trein is shown mounted on flanged wheels for rail service, end on the right it is shown with pneumetic tires, ready for overlend trevel.

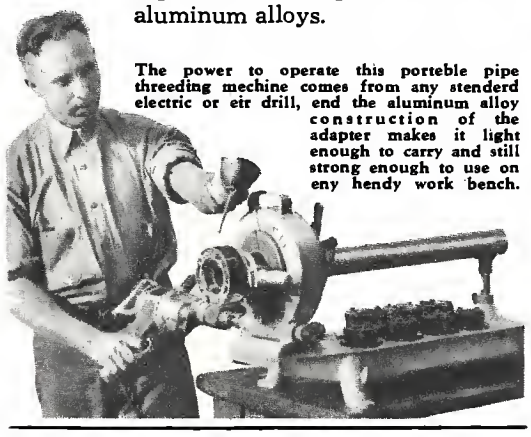
EXPERIMENTS now being conducted by the French State Railway lead to the prediction that within a few months, communities isolated from railroads will be receiving lorry-train service on regular schedule.

For service on rails, the truck and trailers are equipped with regulation flanged wheels, to which larger pneumatic tired wheels can be quickly bolted for overland travel.

Freight handled by the lorry-trains can thus be hauled directly to its destination without being transferred to trucks.

Power Pipe Threader Is Portable

A PORTABLE pipe threading machine weighing but 27 pounds and powered by a standard electric or air drill has been invented to increase the speed and accuracy of threading operations. It forms both left and right hand threads, and is reversible for backing off. The adapter is made of aluminum alloys.



The power to operate this porteble pipe threeding mechine comes from any stenderd electric or eir drill, end the aluminum alloy construction of the adapter makes it light enough to carry and still strong enough to use on eny hendy work bench.

Milk Bottle Taps Cream Line

A PAPER milk bottle containing a collapsible cellophane spout at the cream line has been invented in California to permit the removal of cream without disturbing the milk. To drain the cream, the spout is extended, and the liquid flows into a container. Because of the cheapness of manufacture, the bottle may be discarded after use. The inventor estimates the savings to be effected by the average family using this type of bottle at more than $2 a month.

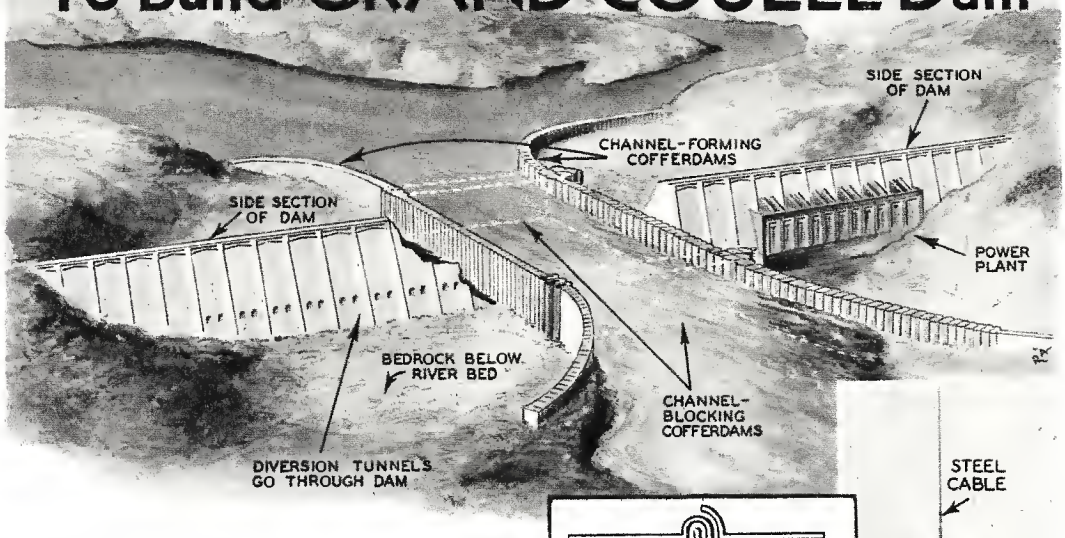
The paper milk bottle is shown here with collapsible cellophene spout extended for pouring.

Paper Windows Admit More Rays

PAPER windows used in the majority of homes in China have been found to admit more than twice as much of the beneficial ultra-violet ray as the glass windows used in American homes. When the paper is oiled, the transmission of rays is even higher. Tests are now being conducted to determine if the paper windows are responsible for the low percentage of rickets in Chinese children. Many tuberculosis clinics prefer paper to glass windows.

Sidetracking the Mighty Columbia

To Build GRAND COULEE Dam



Artist's drawing shows how Columbia River sidetracking problem was solved. Channel-forming cofferdams, now under construction, squeeze the river into a 700-foot wide channel. Cylinders of interlocking steel piling are filled with rock.

HOW could the mighty Columbia River, carrying more water than all other Pacific Coast rivers combined, be sidetracked from its channel? How were the foundations for the highest overflow dam in the world going to be sunk to bedrock without blocking the turbulent river?

This was the greatest problem confronting the engineers who planned Grand Coulee dam, $63,000,000 Public Works Administration project, on the Columbia River in central Washington.

To get the waters of Colorado River out of the way in order that Boulder Dam could be built, the contractors blasted diversion tunnels in the bordering hills, then built cofferdams to force the water into the tunnels and out of the regular channel while the main dam was being built.

At the Grand Coulee, where the Federal government is now at work, this procedure could not be followed. The maximum flow of the Columbia River, the largest entering the Pacific Ocean from the east, is 500,000 cubic feet per second or five times the flow of the Colorado at high water. During the season of low water, the flow of the Columbia is ten times as great as that of the Colorado.

The Columbia flows in a deep gorge between hills that could not practically be pierced by tunnels capable of carrying this immense volume of water.

Before bids on the Grand Coulee were opened in Spokane by the Federal government in the summer of 1934, it was reported that this great difficulty presented in the flow of the Columbia was discouraging some of the nation's big contracting firms from bidding on the project. It is true that only two firms did bid—the Silas Mason Company of New York City, and the Six Companies, Inc., builders of the Boulder Dam.

The Six Companies lost, and the Mason Company, heading a group

[*Continued on page* 118]

Steel sheets 80 feet long, with interlocking joints, are driven to bedrock by pile-driving weight shown above. Each cofferdam cell is about 100 feet in diameter, 125 feet high.

CATCH FISH

by

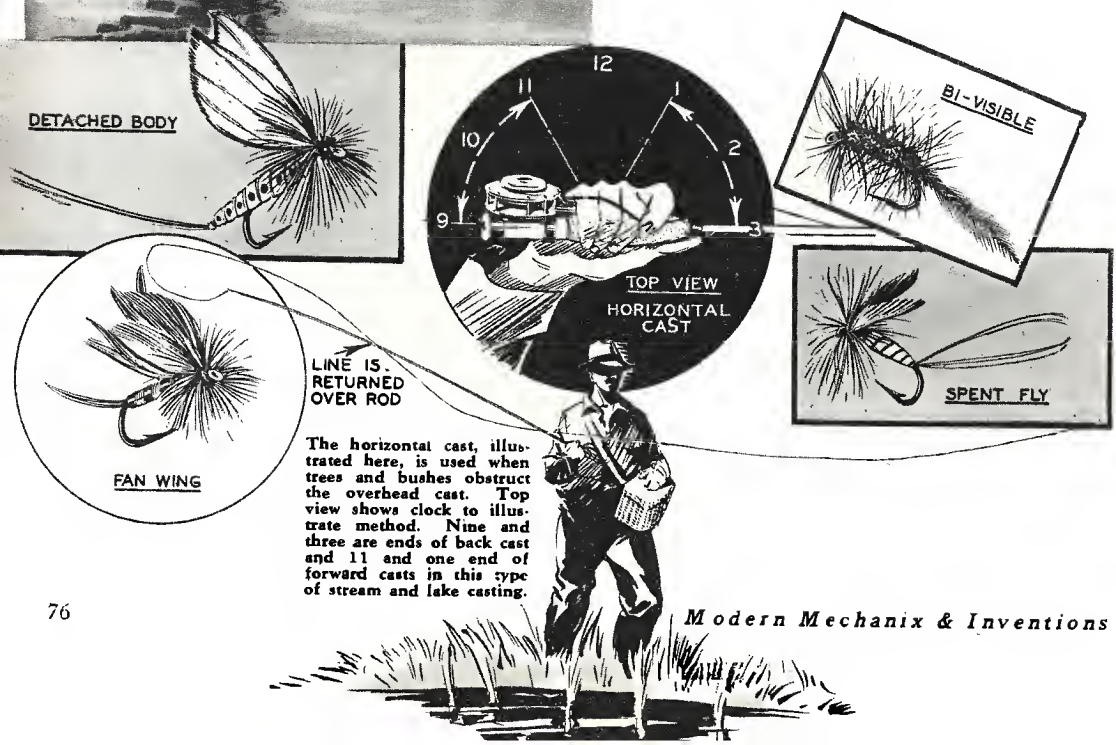
ROBERT PAGE LINCOLN

Hunting and Fishing Editor

IN LATE summer dry fly fishing is the most practical of all methods. The fisherman who fails to give this method of fishing a real trial has missed out on one of the most fascinating methods devised to fool the speckled beauties of streams and lakes. It is the closest method to "playing natural" of any type of fishing. It is the ideal method of taking all game fish, such as bass, trout, and pan fish, that feed on the surface.

In most cases the novice looks upon dry fly fishing as difficult to master and that only men of peculiar skill can ever hope to accomplish its fine points. Nothing is more untrue. In fact, in some ways, it is easier to master dry fly fishing than wet fly fishing. True, there is need of care in placing the fly, floating it just so, in as natural a manner as possible, but with this taken care of, some of the difficulties that clothe dry fly fishing (in the amateur's imagination at least) are smoothed away.

Dry fly fishing is best suited to quiet streams where the flies can float naturally on the water. Study the types of insects found hovering above or floating on the water and select similar fly. Below are different dry flies.

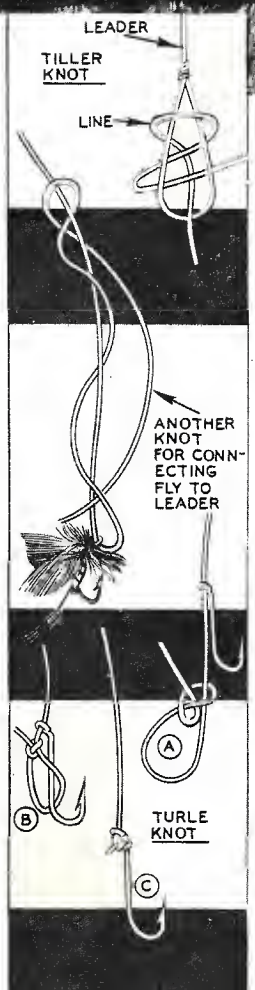


The horizontal cast, illustrated here, is used when trees and bushes obstruct the overhead cast. Top view shows clock to illustrate method. Nine and three are ends of back cast and 11 and one end of forward casts in this type of stream and lake casting.

The NATURAL WAY With DRY FLIES

Late in the summer when other methods fail dry fly fishing is at its best. The sport is not difficult to master, if you will follow the many helpful tips presented here.

Dry fly fishing is probably the best method to use in the crystal clear waters of mountain lakes. In panel at left are three useful knots for fly fishing. For turle knot slip leader through hook eye, tie knot (A), then slip hook through loop (B), and pull on the leader to tighten.



Naturally the first consideration in dry fly fishing is the rod. Here the amateur or beginner meets his first stumbling block. It must be admitted that there are special dry fly rods, ranging in price from forty to seventy-five dollars. Such prices are likely to cause the amateur to quit in despair. The fact is, however, that rods can be picked that will serve both for wet and dry fly fishing as well—that is, by securing a rod that has medium-stiff or moderately-stiff action, since most wet fly rods have a tendency to be too limber or whippy for dry fly fishing. The "all purpose" rod mentioned should be 8½ to 9 feet in length with a weight of 4½ to 5 ounces, depending upon the physical build and strength of arm and wrist of the caster.

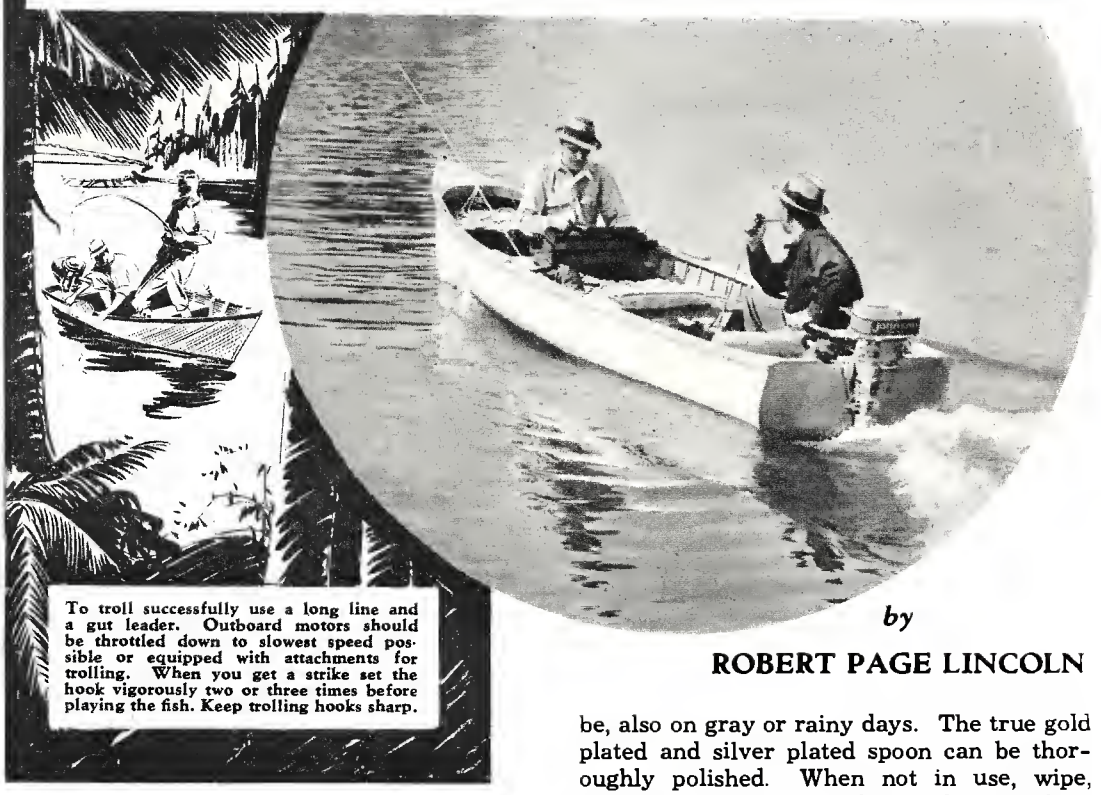
A single action reel that will hold at least 30 yards of line can be used, although larger reels, holding 60 or more yards of line are common and are often used. The reel should have a guide set between the plates through which the line is to pass. This is a definite protection to the line. While the automatic reel is suitable for all other manner of fly work, in dry fly fishing the single action reel is generally recommended.

In average wet fly fishing the so-called level line is used. The tapered fly line is the recommended line for dry fly fishing. If the reader is unfamiliar with this type of line, let it be mentioned that from a certain caliber in the center this line gradually tapers down to a point. Thus the center of the line, the heavier part, will be size E but will taper down to size H toward both ends. Thus a tapered line will be listed HEH or HDH, or HCH as the case may be. Being tapered in both ends you

[*Continued on page* 116]

SPORTSMEN'S

HOW to IMPROVE Your TROLLING



To troll successfully use a long line and a gut leader. Outboard motors should be throttled down to slowest speed possible or equipped with attachments for trolling. When you get a strike set the hook vigorously two or three times before playing the fish. Keep trolling hooks sharp.

by

ROBERT PAGE LINCOLN

AN 18-POUND test hard-braided, waterproofed line makes the best all-around trolling line. When in water where there is a possibility of encountering large muskies or great northern pike, the 24-pound test line is recommended.

When fishing in much-fished waters where the fish are rather cagey and hard to take, the addition of a six to eight-foot synthetic gut leader, bass size, is recommended to make the connection between the line and the lure almost invisible. You will take three times as many wall-eyed pike using a leader of this sort.

Most of the failure in taking fish on the trolling spoon lies in the fact that it lacks luster, and is faded and washed out. The brighter your spoon, the more valuable it is. If you want to ensure many catches, and probably some record ones, have your best spoons silver plated or gold plated. You will find the gold plated spoon a deadly one when the water is not quite as clear as it should be, also on gray or rainy days. The true gold plated and silver plated spoon can be thoroughly polished. When not in use, wipe, polish and give them a film of white vaseline, then wrap in soft tissue paper. It may be a little bother, but it is well worth your while.

Ninety per cent of the fishermen troll with too short a line. In most waters it is well to troll with no less than 75 feet of line out behind your boat, and from there on up to 100 feet, depending upon the depth of water in which you are trolling. With a short line out, the fish has hardly recovered from his suspicions at seeing the boat go by before the lure is in front of him. Hence he fails to rush out at it. With a long line out he will have recovered his frame of mind, so that when the lure comes along he is taken quite unawares.

A light rod for trolling purposes should not be used because the rod must have considerable backbone to properly set the hook. A 5 to 5½ foot bamboo trolling rod can be used but even better is the triangular solid steel rod in the trolling or heavy casting type. This

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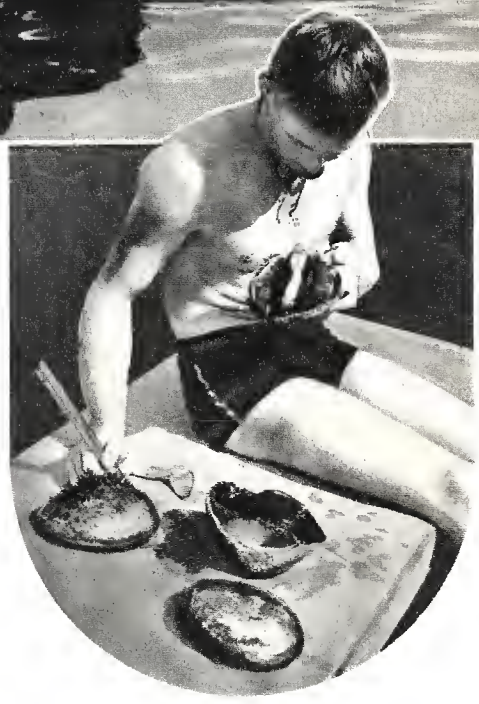
DIVING For ABALONES

by PAUL W. GARTNER



Above—Paddling to shore with a catch of abalones. The abalone hunter uses a surfboard to reach coves. He dives to bottom, forces the abalone off rocks with steel tool, brings it to surface, and places it on the surfboard, to which the abalone clings. Right—Closeup of abalones. They are mollusks related to the octopus, oyster, clam, and squid, and are hunted for their flesh. The shells are used in manufacturing mother-of-pearl ash trays and lamps.

ALONG the rocky stretches of the Pacific coast aquatic sportsmen quest the abalone, a large shell animal that clings with phenomenal tenacity to submerged boulders. Not only is its flesh considered among the finest of marine delicacies, but the mother-of-pearl shell, often used in manufacturing novelties, is a coveted trophy.

Sometimes along particularly isolated shores abalones can be taken from rocks which are exposed during rare, extremely low tides. But the game is far more abundant in deeper water and more venturesome swimmers obtain their catches by diving. The practice has created a new sport.

The sporting abalone hunter equips himself with a surf or paddle board and a prying instrument which is commonly a short length of automobile spring which has been drilled at one end so that a line or strap may be used to hold it to the diver's wrist. Protective diving goggles may or may not be included in his equipment.

When the tide is at ebb the hunter launches his paddle board in some quiet cove. Then, while kneeling or lying face downward upon the board, he paddles with his arms off the rocky shore. He is searching for an area where eel grass, kelp, sea lettuce and other marine vegetation grows up from the submerged rocks, for such growth comprises much of the abalone's food.

Locating an area of this nature the abalone hunter slides from his board and makes a surface dive. In this method of submergence the swimmer, while in forward motion, suddenly ducks his head and arms and doubles up jack-knife fashion, as if he were attempting to touch his toes. Then he swings his

[*Continued on page* 128]

Asbestos Clad Inventor Defies Flames

Not until the blazing airplane in which he was testing an asbestos suit was almost reduced to ashes did this inventor, shown at right, leave the cockpit. He was unharmed by heat.

DEFYING searing flames that would have meant death in a moment under normal circumstances, an English inventor calmly remained seated in the cockpit of a burning plane to test his asbestos suit.

In outward appearance the suit resembles conventional winter flying togs with abnormally large helmet and visor. A special apparatus suspended over the breast cools the air for breathing purposes.

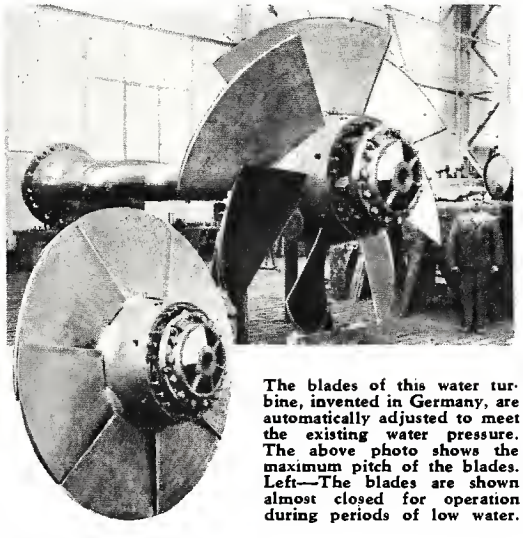
The burning airplane test was conducted as a demonstration for the Royal Aeronautical Society of England. When the flames had reached their peak, the inventor stepped from the plane unharmed, another successful invention to his credit.

Robot Controls Water Turbine

OPERATING on the same principle as a steam engine governor, an electric-magnet system invented in Germany automatically regulates the pitch of the propellers on a new water turbine to meet the water pressure.

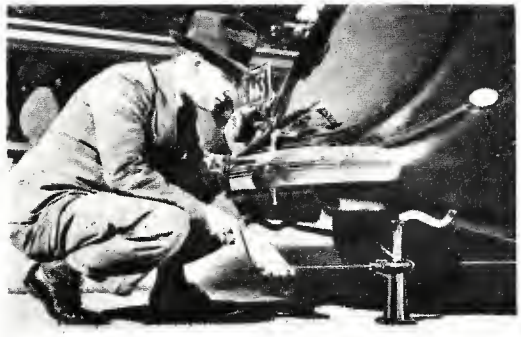
When the water level supplying the power to operate the turbine decreases, the electric magnet system narrows the angle between the propeller blades. Under heavy pressure, the blades are opened, permitting more water to rush through.

In this manner the number of revolutions of the turbine remains constant, and the generated current remains the same. This type of turbine is particularly adapted for operation on small streams where the water supply varies.



The blades of this water turbine, invented in Germany, are automatically adjusted to meet the existing water pressure. The above photo shows the maximum pitch of the blades. Left—The blades are shown almost closed for operation during periods of low water.

Chassis Extension Is Jack Rest



This extension bolted to the chassis side members at both front and rear provides an accessible jack rest on streamlined cars. Tire changing is much simplified by this improvement.

THE overhang streamlining of the new cars having made tire changing difficult due to trouble in operating the jack, Pontiac engineers have provided extension arms on the chassis side members at both front and rear. The arms thus provide a jack rest within easy reach of the operator.

New Method Freezes Fish Alive

A FLEET of "refrigerator" trawlers now being built in England at a cost of $280,000 will be equipped to freeze alive all fish caught at the rate of 50 tons a day. Instead of icing the fish, they will be placed alive in a series of hoppers, the first four of which contain air at sub-zero temperature, and the last four with brine, also of sub-zero temperature. When they come out of the last hopper they are frozen solid, and will keep fresh indefinitely.

NEEDED Business Office INVENTIONS Include Typewriter Erasing Key

HAND PUNCH WITH CHANGEABLE DIES
LETTER OPENER TO OPEN BUNDLE OF MAIL
HAND OPERATED ENVELOPE SEALER
SIMPLE POWER ERASER
Lucky is the inventor who produces one of these needed office inventions. Get free patent advice from Patent Editor, Modern Mechanix & Inventions Magazine, Minneapolis, Minn.; enclose a stamped envelope.

THE American business office has reached a high degree of efficiency through the application of labor-saving equipment. The business man is quick to see and buy anything that will speed routine and reduce costs. This has been a lucrative field for inventors, and today there is more opportunity than ever before. This month our list of needed inventions will be held strictly to those things that can be used in business offices, small and large.

Our typewriters should be provided with an erasing key. This key should strike a hard, brushing blow that will obliterate a single letter at each stroke. The inventor of such an article can ask his own price.

Speaking of erasers also reminds us of the fact that we need a power-driven eraser for bookkeepers and draughtsmen. There are available today motor-driven erasers, but these are far too expensive for wide application. The need should be filled by a small electro-magnetic eraser driven by a solenoid or an electro-magnet. If such an article could be made to sell for three dollars or less, it would earn a great deal of money for its inventor.

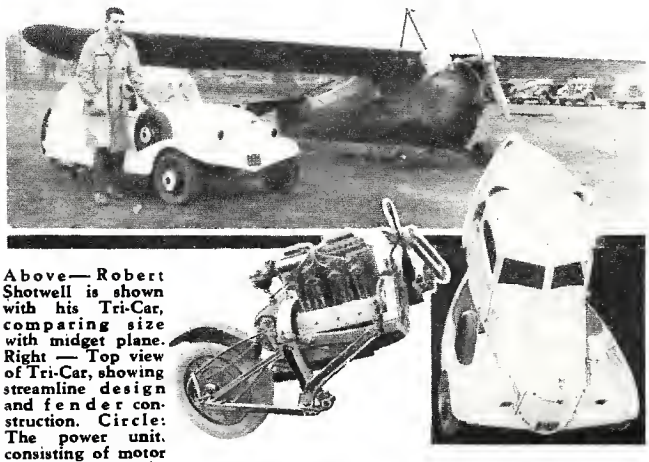
Hand punches are used a great deal in offices; there is needed a simple double and triple punch that will produce two or three holes in a sheet at one time. The distance between the holes should be adjustable.

There is also needed a hand punch with interchangeable dies, allowing holes of different size and shape to be punched. There is a small fortune in either one of these ideas.

It is one of the problems of large business offices to keep desk tops clean and free from ink that falls from pens. The pen wiper is not used because it takes too much time. Consequently a cheap little device placed next to the ink bottle would be a big seller if it could wipe a pen point clean with a single

[*Continued on page* 142]

Homemade Tri-Car Can Do 85 M. P. H.



Above— Robert Shotwell is shown with his Tri-Car, comparing size with midget plane. Right — Top view of Tri-Car, showing streamline design and fender construction. Circle: The power unit, consisting of motor cycle engine, axle, and a drive wheel.

A SPEED of 85 miles per hour and a gasoline consumption of but one gallon for 40 miles are the outstanding features of the Shotwell "Tri-Car" which is constructed about a 4-cylinder motorcycle engine.

Work on the midget speedster was done during the spare time of the builder, Robert Shotwell, of Minneapolis, with a material cost of but $175. The motor is mounted in the rear, the motor, axle, and rear drive wheel being a single unit.

Beneath the hood is room for the fuel tank, battery and a luggage compartment. An auto generator mounted on the engine supplies the battery with current. Ventilation for the motor is supplied through air ports on the sides. The fenders and body were hand hammered from sheet steel.

Lawn Mower Has Reverse Shift

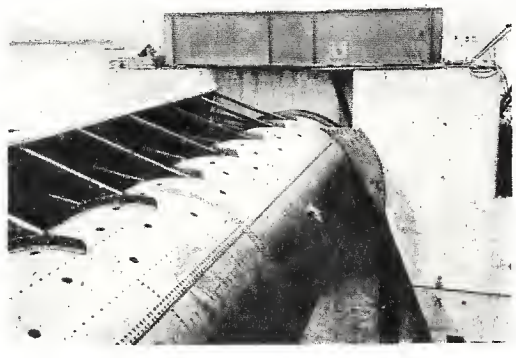
A HAND powered lawn mower with a reverse gear shift has been perfected for cutting grass on terraces, not only when pushed over the slope but also while being drawn back. As the lawn mower is pushed forward, it cuts grass in the conventional manner, and then, by a quick reversal of the handle, it cuts grass on the backward pull.

In the reversed position, the mower is particularly adapted to cutting around flower beds and under shrubbery where one hesitates to push a machine.

By means of a second gear shift, the cutting blade reel may be lowered or raised to cut the grass at any desired level.

This lawn mower can cut both backwards or frontwards, and can be raised or lowered by the lever held by operator to cut grass at any desired level.

Dam Gets Own Hot Water Bottle



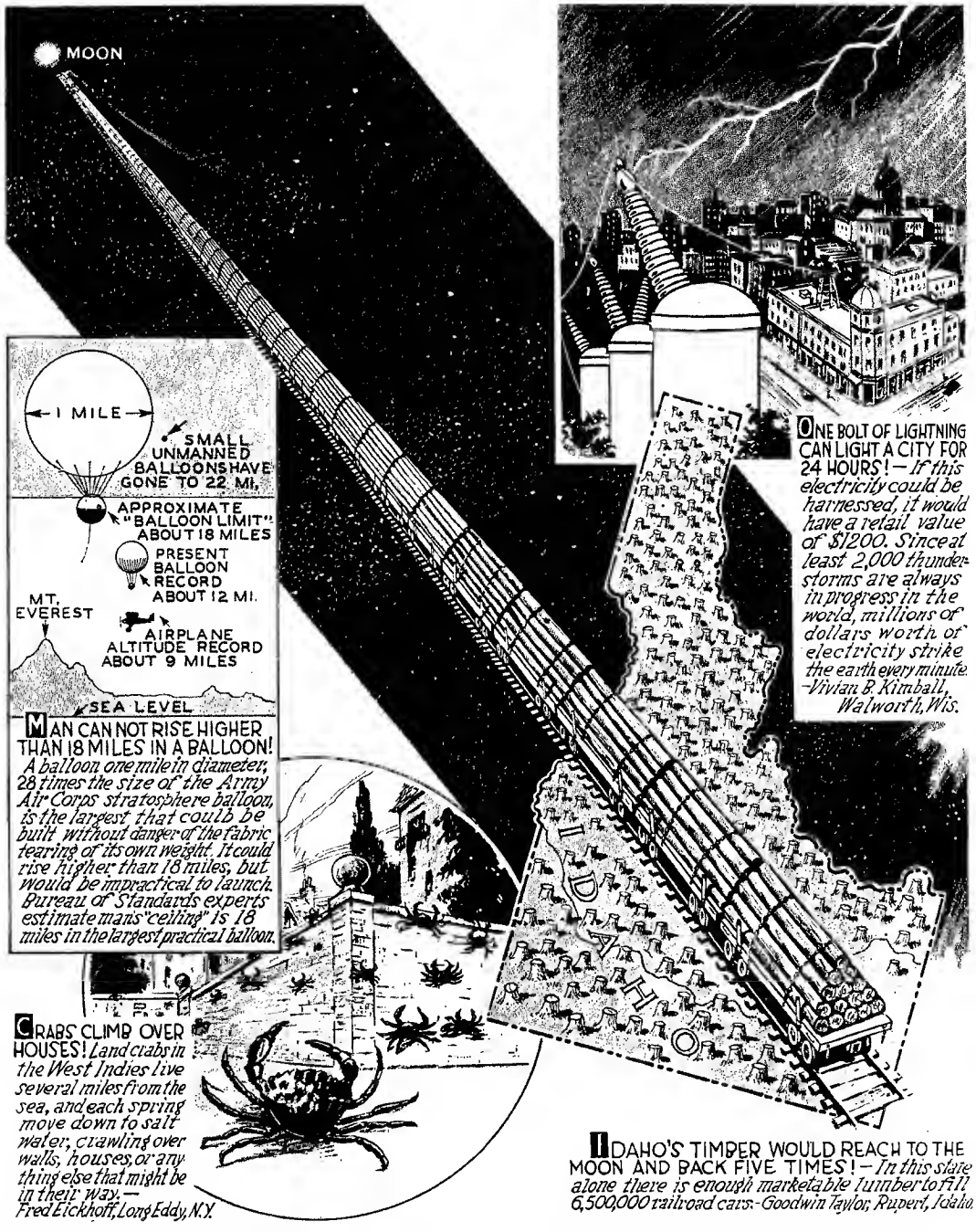
A view of the roller-gate dam at Canton, Mo. Just behind the steel gate is the concrete piece in which are installed 6 mammoth water heaters; these melt ice around dam in winter.

TO PREVENT any trouble with ice formation at the roller-gate dam now under construction across the Mississippi river at Canton, Mo., engineers are installing mammoth hot water heaters to keep Old Man River above the freezing point at the dam.

Any formation of ice would block operations of the main gates of the dam, which consist of huge rollers, or drums, some of which are 109 feet long and 20 feet in diameter. The drums are raised by rotating on sills built into concrete piers, and about the sills heating units 27 feet long are being installed.

Idaho's Logs Could Reach Moon

Says Nic Sprank in Oddities of Science



MAN CAN NOT RISE HIGHER THAN 18 MILES IN A BALLOON! *A balloon one mile in diameter, 28 times the size of the Army Air Corps stratosphere balloon, is the largest that could be built without danger of the fabric tearing of its own weight. It could rise higher than 18 miles, but would be impractical to launch. Bureau of Standards experts estimate man's "ceiling" is 18 miles in the largest practical balloon.*

ONE BOLT OF LIGHTNING CAN LIGHT A CITY FOR 24 HOURS! — *If this electricity could be harnessed, it would have a retail value of $1200. Since at least 2,000 thunderstorms are always in progress in the world, millions of dollars worth of electricity strike the earth every minute.* —Vivian B. Kimball, Walworth, Wis.

CRABS CLIMB OVER HOUSES! *Land crabs in the West Indies live several miles from the sea, and each spring move down to salt water, crawling over walls, houses, or anything else that might be in their way.* — Fred Eickhoff, Long Eddy, N.Y.

IDAHO'S TIMBER WOULD REACH TO THE MOON AND BACK FIVE TIMES! — *In this state alone there is enough marketable lumber to fill 6,500,000 railroad cars.*—Goodwin Taylor, Rupert, Idaho.

Win $1! Send your Oddity of Science to Nic Sprank, Modern Mechanix & Inventions Magazine, 529 South 7th Street, Minneapolis. None accepted unless source or proof is given. Do not include oddities with other manuscripts or letters.

MATCH-MAKING—

In match-making, mechanical fingers have replaced human hands. The first step, shown above, is the de-barking of white pine logs which are later fed into splint machine.

Weighing some of the dozen different ingredients used in the manufacture.

Millions of splints fall from the drying kilns into hoppers where the mechanical fingers insert them in revolving drum.

by LIEUT. DON BENN OWENS

FORTY-ODD years ago, more than 1,500 persons, laboring 16 hours a day, were needed to turn out 2,000,000 finished match boxes. Today, with modern match box making machinery, two persons are capable of producing an identical number of match boxes in an eight-hour day.

Similarly, the modern match-making machine, requiring the services of but four workmen, turns out more than 100,000,000 finished matches in a single workday!

More striking, perhaps, is the fact that 3,000 odd persons on the payroll of the match manufacturers in this country, in 1929 earned for their employers more than $19,500,000.

What is the ingenious process in the mass production of matches which permits realizing huge profits in the manufacture of so small an article?

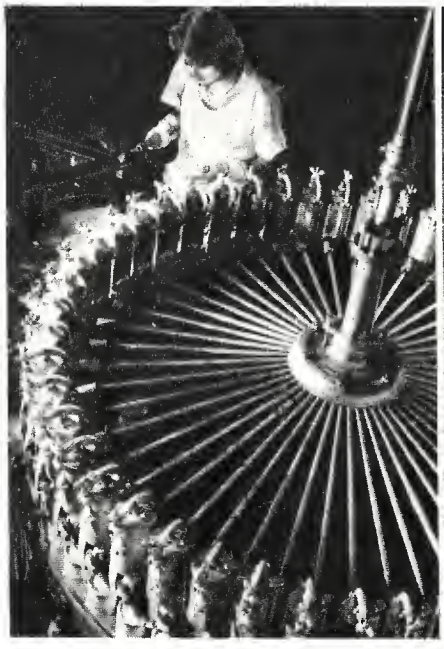
In preparing the "splint" for use in the match-making machine, logs with the bark still attached, eight feet in length and ten inches in diameter, are cross-cut into convenient lengths.

Next, a de-barking machine, consisting of a vertically rotating disc faced with knives, cuts away the outer covering. The log is then slit into thin veneer, one-tenth of an inch in diameter, and fed into the continuous match-making machine.

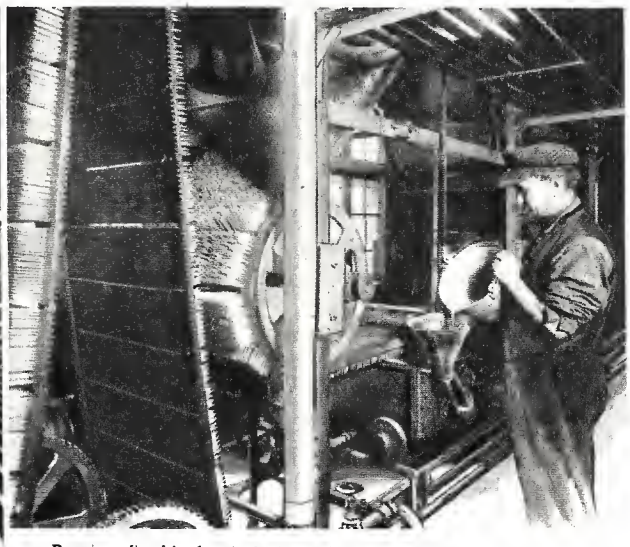
Impregnation of the match stick is the next operation. Immersed in a boric acid solution, the splint is dried, cleaned and straightened.

An enormous steel plate, resembling a huge water-wheel, has a surface perforated by thousands of tiny holes just large enough to hold a match stick. As this steel plate ro-

From LOG To LIGHT



Above—Impregnating splints with boric acid solution to prevent afterglow when match is struck.



Pouring liquid chemicals into tipping machine. Note bristle-like matches on belt being carried through three compositions in which match heads are dipped to form the combustible crowns for striking.

tates, almost human fingers pick up the match sticks from the hopper and insert them in the tiny perforations on the cylinder. When all the holes are filled, the cylinder moves forward along the metal table, warming the splints over a heated metal block to absorb paraffin. The cylinder revolves once inside the molten paraffin basin, then moves on to the "striking compound" to form the ignition head of the match.

When the splints are thoroughly impregnated, the cylinder passes over the metal hot-plate. By the time it reaches the end of the table the splints are entirely dry and ready for packing.

Here metal fingers again snap into action, grasping the matches in huge handfuls and piling them in boxes. As the boxes are filled, a conveyer moves them to the packing room where they are crated for market. In the shipping room the match comes in contact with human hands for the first time. All previous operations from the moment the match splints entered the hopper were entirely automatic.

The speed of the continuous match-making machine may be set according to factory requirements from 175 to 475 revolutions a minute. A single revolution of the cylinder completely finishes an operation.

While a box of 500 matches sells for only a nickel, the cost of match-making materials used is really negligible. As a matter of fact, four persons operating one machine can, in eight hours, turn out matches with a retail value of more than $10,000!

The manufacture of the match box, an indispensable part of the match industry, likewise demands low cost production. A roll of strawboard paper, cut to the proper width and lined with pink or white paper, is placed in an ingenious machine. The strawboard paper is scored or marked at the four corners, then glued, folded into an endless tube and passed through a press where it is imprinted on three sides.

Another machine coats sand or ground glass for a striking surface on the fourth side. One of these machines can turn out 24,000 finished boxes hourly.

Book matches are manufactured by an entirely different type of machinery. Wood or tough fiber is cut into "combs," dipped into match-making compound, dried, packed and marketed in the more convenient pocket form.

More than 11 per cent of the matches used by Americans are brought into the country from Japan, France, Sweden and Norway.

Hardware Dealer Fashions Feminine Hats from Merchandise

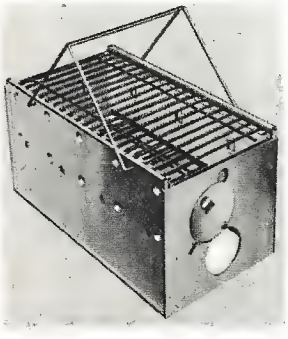
Left—Hardware Military Bonnet. Right—"Afternoon" hat.

SOUP strainers, window screening, metal scouring pads and even fishing plugs were fashioned into hats by an ingenious hardware merchant in dressing up his windows for a special sale.

A tray from a weighing scale furnished the foundation for a "Military" bonnet which included such accessories as a metal scouring cloth chin strap and a cocktail strainer pom. He fashioned the brim for an "Afternoon" hat from a strip of window screen, used a soup strainer for the crown and fishing plugs and a scouring pad for the feminine frills. An upended paint brush was used to produce the final touch in chic styling.

Camper's Stove Controls Heat

AN OUTDOOR camp stove embodying many features of the kitchen range will be placed on the market this fall. The new stove is a charcoal and wood burning unit built so that the fire can be controlled. The stove is 20 inches long by 11 inches high and wide, and is finished with an aluminum coat. Air holes at the bottom of the stove control the draft.



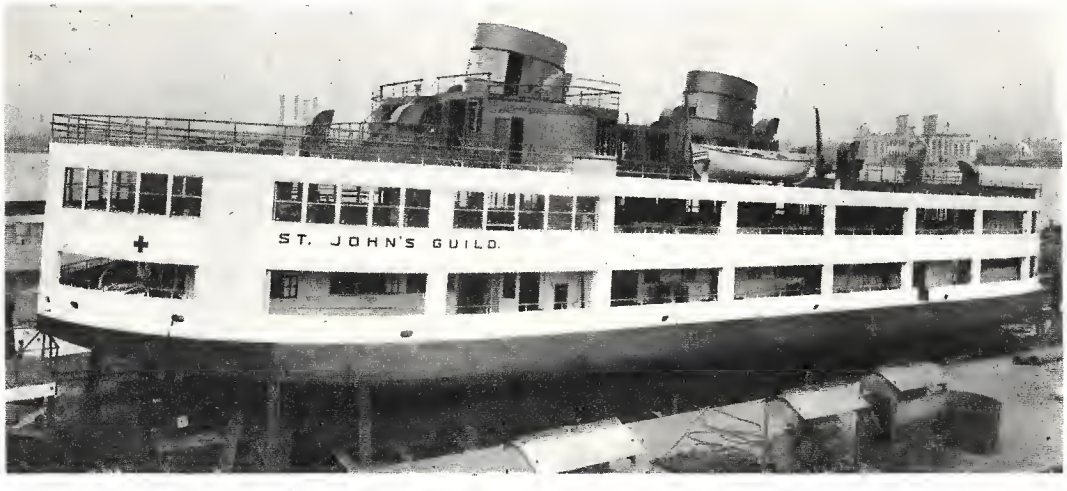
This outdoor camp stove is built for cooking temperature control.

Floating Hospital Features Safety

FIREPROOF and unsinkable, the new hospital ship of the St. John's Guild, New York City, represents the maximum in safety for passengers afloat. The ship will be used to take the sick and poor children, together with their mothers, on health giving cruises in New York harbor and up the Hudson river.

There are 25 separate compartments in the watertight subdivision of the craft, more than enough to keep the vessel afloat in the event the hull is crushed in a collision. The ship could be cut in two at any point along her length, and both sections would remain afloat and on an even keel.

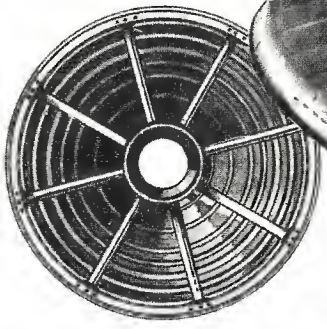
The entire hull and all furniture and interior appointments are made of metal or other fireproof materials.



The St. John's Guild hospital ship, the safest boat afloat, is shown here about to be launched in New York harbor. The boat, built for the benefit of the poor children, is entirely fireproof, and has 25 watertight compartments to prevent sinking.

300 Mile-An-Hour Zep-Plane Proposed

Above—A model of the airplane-Zeppelin. Corkscrew vanes, driven by an airplane motor give 300 m.p.h. speed.

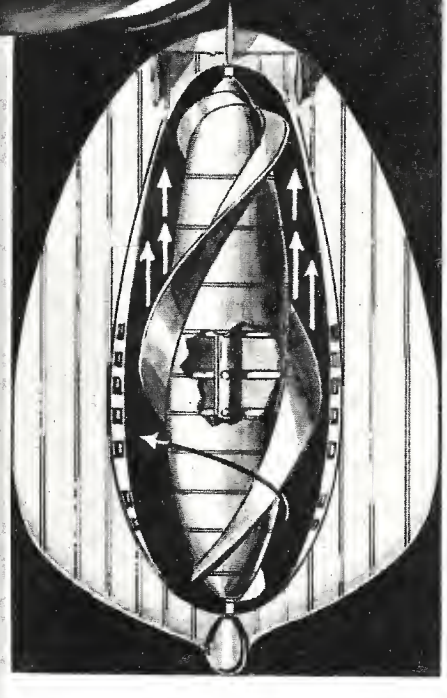


SECTION THRU HELIUM-FILLED ROTATING BERYLLIUM GAS BAG

CAPABLE of rifling its way through the air at a speed of 300 miles an hour, or hovering motionless above a chosen spot, an airplane-Zeppelin soon to be put through exhaustive tests at Rapid City, S. D., is expected by its inventors to become the transport plane of the future.

Startling though the design of the plane may be in its radical departure from accepted plans, combining as it does features of both the airplane and the Zeppelin, it represents years of work on the part of Rev. C. H. Loocke, known as the "Flying Parson," and Lorin Hansen, a young printer.

Suspended in a structure resembling a conventional airplane minus the fuselage is an all-metal, cigar-shaped gas chamber provided with corkscrew type driving vanes. This hull is built of beryllium and filled with helium gas to provide a large percentage of the lift.



Artist's conception of the proposed 100-passenger Zep-plane and a diagram of operation are shown.

Gas Balloons Become Freight Cars in Russian Sky Train

Most recent of aerial innovations is this Russian sky train in which three gas-filled balloons act as freight cars for the airplane locomotive. In a Moscow to Serpukhov test flight, the sky train averaged 105 miles per hour.

BY USING an airplane for a locomotive and balloons for freight cars, Russian aviators hope to solve the problem of carrying freight cheaply by air, a factor much sought for in Russia because of the vast areas isolated from railroads, highways and waterways.

Freight glider trains first were thought to be the answer, but engineers were unable to overcome the difficulty of launching the loaded crafts. Recent experiments with balloon trains have proven much more successful.

The balloons furnish the lifting power for the freight gondolas suspended beneath, while an airplane furnishes the towing power. In a recent flight, three freight balloons linked together by cable, were towed 70 miles in 40 minutes by a single plane. Other tests are planned.

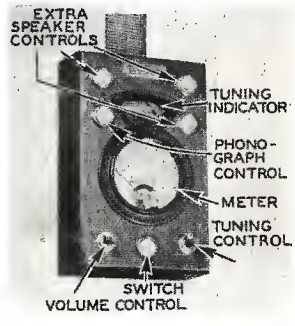
Radio-Phonograph Is Portable

ANSWERING the demand of small apartment dwellers and traveling music lovers, electrical science has produced a combination radio-phonograph so small it could easily be placed in an overnight bag. The radio set has five tubes, and produces an excellent tone even when tuned in on distant stations. The turning table of the phonograph is demountable, and can be compactly packed in the case. The radio set controls the volume of the recording, and the current can be supplied from any socket.

This midget radio-phonograph instrument is so compact it can be placed on any bookshelf, end table or dresser, and yet it is so accurate it can be tuned in on distant stations with life-like reproduction. Its reproduction of phonograph records is said to be equal to that of larger sets. It comes completely equipped in a small, sturdy carrying case.

Midget Robot Selects Programs

ADDING the last word of luxury to the radio-phonograph instrument, electrical engineers have produced a remote control box less than half the size of a cigar box that can select radio programs, adjust the volume, turn from radio to phonograph, and even select the desired record. It operates from any room.

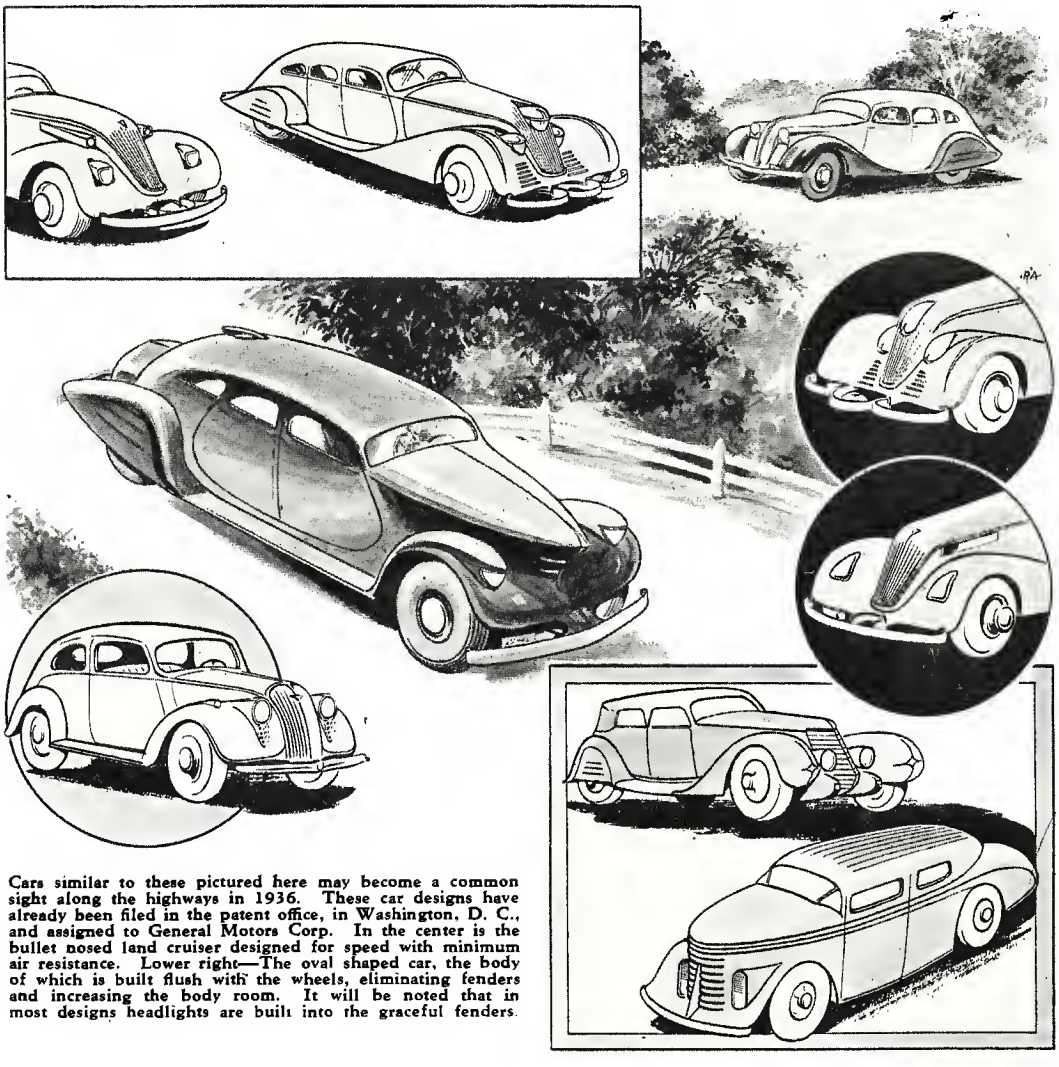


A view of the 7-inch long remote control box, showing instrument panel. It can be used anywhere.

National Television Gets Boost

POSSIBILITIES of a national station-to-station television hook-up have been greatly increased by the announcement from Major Edwin F. Armstrong that he has perfected equipment for that service which uses ultra-short wave lengths for transmission. His invention is regarded with particular significance because of the failure to date to invent a means of sending television programs from station-to-station by wire. He increased the range of ultra-short wave sending to 100 miles recently.

New Car Designs Forecast 1936 Models



Cars similar to these pictured here may become a common sight along the highways in 1936. These car designs have already been filed in the patent office, in Washington, D. C., and assigned to General Motors Corp. In the center is the bullet nosed land cruiser designed for speed with minimum air resistance. Lower right—The oval shaped car, the body of which is built flush with the wheels, eliminating fenders and increasing the body room. It will be noted that in most designs headlights are built into the graceful fenders.

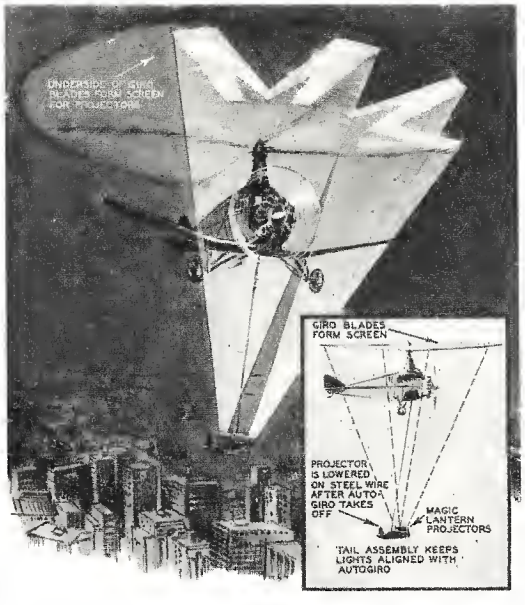
NEVER before in automotive history has design been of such paramount importance as it will be in 1936 when the manufacturers release their new models for the approval of the motoring public. What can be expected in the 1936 model automobile?

While the race for engineering perfection has continued at an undiminished pace, manufacturers have become increasingly aware of the fact that the majority of cars are being sold on their outward appearance and size coupled with the interior appointments. Engine performance, because of the public's confidence in almost all types of automobile engines, has become of secondary importance.

Several startling innovations in body design will be apparent as the new cars make their debuts at mid-winter automobile shows. However, it is expected that the great majority of makes will adhere to the present trend in streamlining, the attention being directed towards smoother lines. Fender construction in particular will receive special attention, with nearly all makes incorporating headlights in the front fenders.

Some idea of future automobile styles can be obtained from designs being filed in the patent office at Washington, D. C. Illustrated on this page are several car designs assigned to General Motors Corporation.

Autogiro Blades Form Screen for Floating Ads After Dark


UNDERSIDE OF GIRO BLADES FORM SCREEN FOR PROJECTORS
GIRO BLADES FORM SCREEN
PROJECTOR IS LOWERED ON STEEL WIRE AFTER AUTOA GIRO TAKES OFF
MAGIC LANTERN PROJECTORS
TAIL ASSEMBLY KEEPS LIGHTS ALIGNED WITH AUTOGIRO

Hovering almost motionless in the air, this autogiro, equipped with magic lenterns, can present aerial advertisements at night by using the rotating bledes as e scraen. Inset—Side view, showing method which is used to project the message.

DISPLAY advertising at night by means of a magic lantern suspended beneath an autogiro, with the rotating blades serving as a screen, is a German inventor's latest medium for placing a product before the public eye.

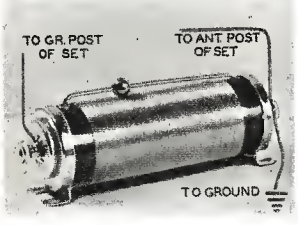
The magic lantern assembly is placed in a torpedo shaped carriage equipped with vertical and horizontal rudders to keep it in perfect alignment with the autogiro flying above. It can be raised or lowered by means of a cable, for focusing the advertiser's message on the blades. When landing, the projector is drawn up into the fuselage.

To insure perfect reproduction of the advertisement, the under sides of the rotor blades are specially treated. The autogiro has been found to be particularly adapted for this type of aerial advertising because of its ability to hover almost motionless in the air, while the blades revolve fast enough to form an uninterrupted screen.

Radio Service Improves Reception

A FULL tuned circuit is added to a radio receiver by means of a three-in-one accessory which functions as an antenna tuner, wave trap or aerial eliminator.

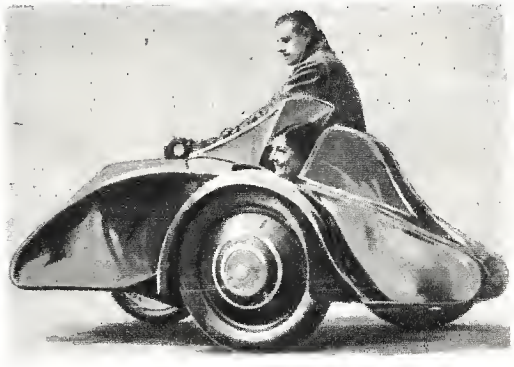
The device, which consists of a fixed condenser and a finely adjustable inductance, increases the volume of weak stations when connected across the aerial and ground wires to act as an antenna tuner. For use as a wave trap, it is connected in series with the aerial lead alone. A slider adjustment can thus tune out an interfering station. When connected in series with the ground wire or across the aerial and ground terminals, it acts as an aerial eliminator, and the ground alone is used for signal pickup.



This three-in-one redio device, 5 inches long, can serve as aerial eliminetor, weve trap or antenna tuner on any radio receiving set.

The little device, available at department stores as well as radio shops, will improve reception on any radio receiving set, it is claimed.

Luxury Side Car Is Streamlined



High speeds without sacrifice of comfort are possible in the streamlined motorcycle cer, shown above. The long slanting windshield provides ample protection from wind.

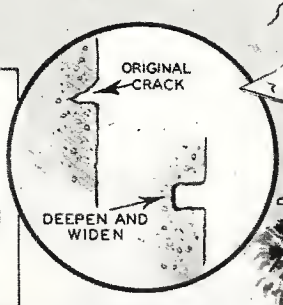
DRESSED up in modern streamlining, the new motorcycle side car which is making its appearance on European highways is making a strong bid for popularity among motorcycle enthusiasts.

The latest side car of streamline design has a windscreen which extends well over the passenger's head, with a head rest in the rear built up to follow the sweep of the air stream. Along the bottom edge of the screen is an adjustable ventilator which provides a flow of air to all parts of the car.

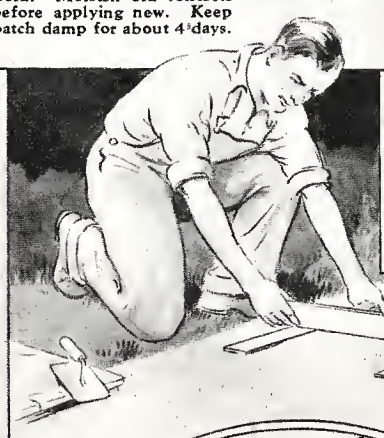
The blunt nose of the earlier model side car has been replaced by long sweeping curves.

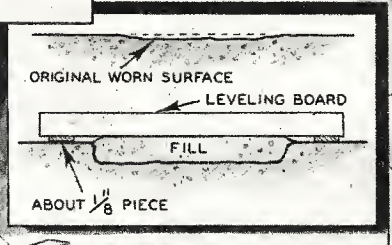
HINTS ON TAKING CARE *OF YOUR HOME*

PATCHING CEMENT STEPS—Original break must be deepened and under cut so that patch will hold. Moisten old concrete before applying new. Keep patch damp for about 4 days.



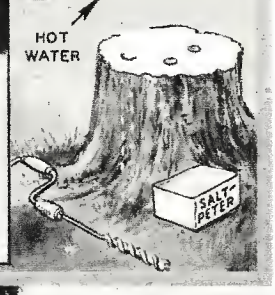
EXTERIOR WALL CRACKS—Use mixture of one part cement, three parts sand, and water to make it workable with trowel.

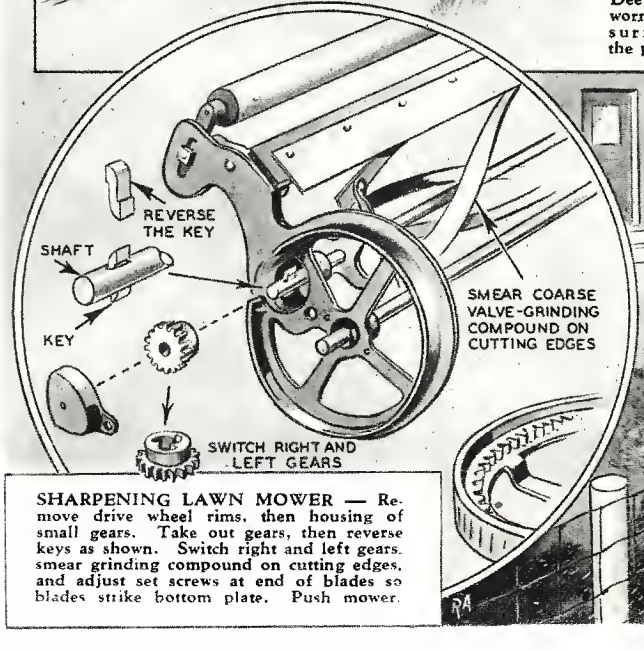




REPAIRING CEMENT FLOORS—Patch must be higher than floor level to allow for settling and shrinking of new cement. Deepen and widen worn or cracked surface so that the patch will hold.

DESTROYING STUMPS — Drill deep holes, fill with saltpeter and pour in hot water. After this dissolves repeat operation. In two weeks build a fire around the stump.





SHARPENING LAWN MOWER — Remove drive wheel rims, then housing of small gears. Take out gears, then reverse keys as shown. Switch right and left gears, smear grinding compound on cutting edges, and adjust set screws at end of blades so blades strike bottom plate. Push mower.

KEEPING DOGS AWAY—Spray stone, cement or wood with mixture of gasoline and as much naphthalene as will dissolve. At dog and cat gathering places under bushes, etc., scatter moth-balls or spray with kerosene.

IT'S EASY TO MAKE

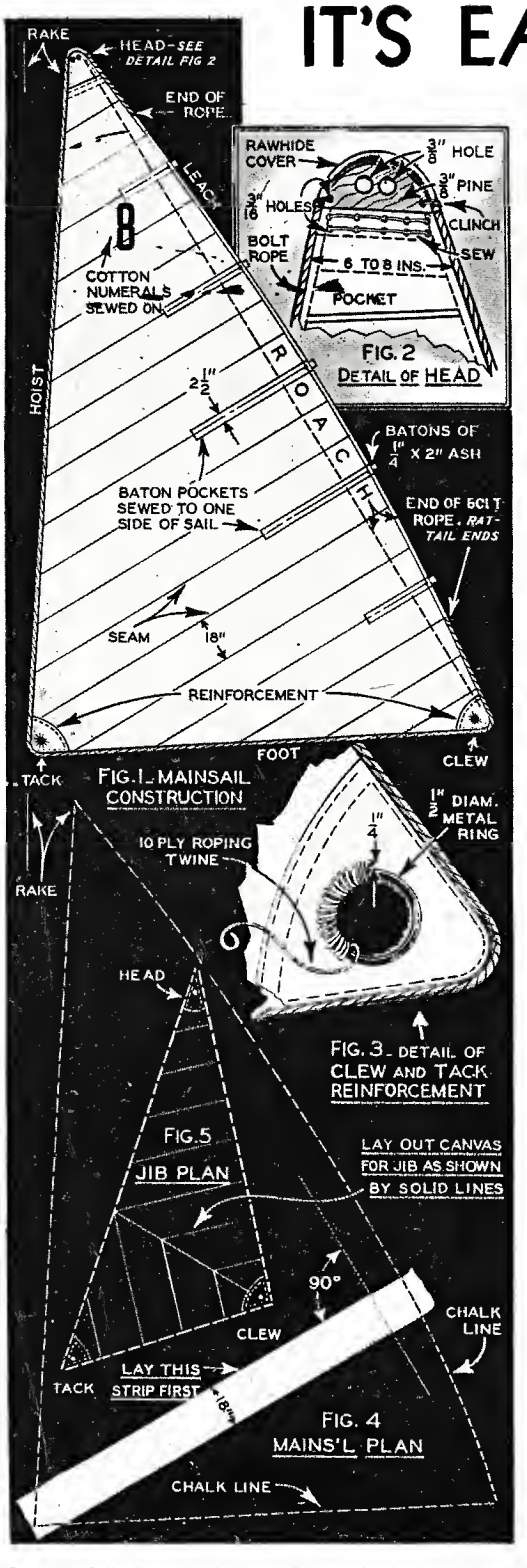


FIG. 1 - MAINSAIL CONSTRUCTION

FIG. 2 DETAIL OF HEAD

FIG. 3 - DETAIL OF CLEW AND TACK REINFORCEMENT

FIG. 5 JIB PLAN

FIG. 4 MAINS'L PLAN

Lay out full size sail plans on floor with chalk, as above.

SAILMAKING isn't a difficult craft. For the cost of materials alone you can fit your boat with a suit of well-cut sails, by following these simple sailmaking rules.

Whether you are replacing old sails or equipping a newly-built craft, discard copying methods for a perfect fit. An old sail undoubtedly has stretched out of size and shape, and is useless as a pattern.

For either new or old boats, measure the hoist along the mast, from the boom fitting to mast sheave. If the sailboat is gaff-rigged, include the gaff measurement. With the proper angle for the tilt of the mast, if any, make a scale drawing of the proposed sail, one inch to a foot. Allow four inches on all sides for hemming, but nothing for seams, because the stretch of new canvas offsets what is lost in sewing.

Next mark out with chalk on the floor the full-size sail plan, as in Figs. 4 and 5. Should the attic or garage be too small, lay out the upper half of the plan within the lower half. Form the roach—the curvature along the leach, which is shown in Fig. 1—by bending a light batten from the peak or head to the clew, and chalking along it on the floor.

What About Sail Materials?

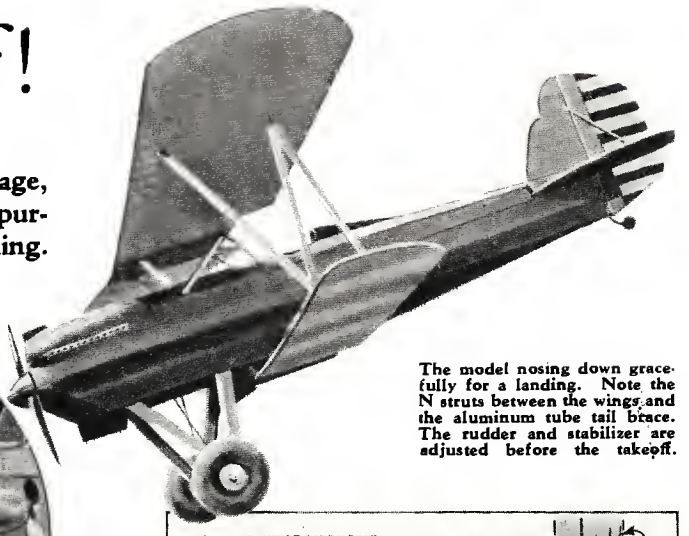
A light grade of army duck produces an efficient, economical sail. For less porous qualities, however, choose light wamsutta, which is somewhat more expensive. Material 18″ wide is preferable. When you buy the sail-cloth, purchase a leather palm, 2½″ tricornered needles and some sailmaker's twine. The palm has a perforated steel disc attached to the leather to protect the hand while pushing the needle through thick-layered canvas or rope. Complete kits of sailmaking tools and materials were recently placed on the market.

For greatest durability, the canvas must run diagonally through the sail. Lay the first strip of canvas at right angles to the leach so that the inner end will form a point at the tack, when cut, as in Fig. 4. In laying out the rest of the area, thumb-tack each piece to the floor, parallel to the first. Each strip should be cut roughly to the chalk marks.

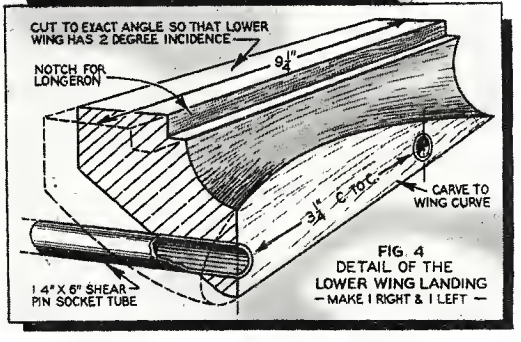
With the full area, or half of it spread (depending upon room size), begin with the first

Takes Off!

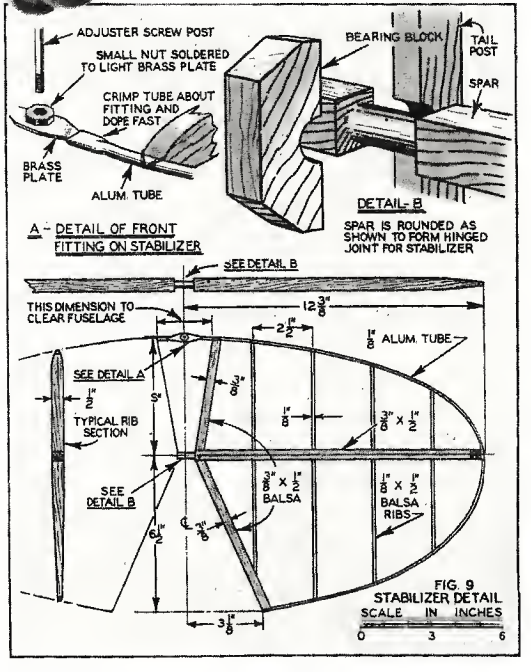
Build the wings, cover the fuselage, set the motor and this six-foot pursuit ship is ready for launching.



The model nosing down gracefully for a landing. Note the N struts between the wings and the aluminum tube tail brace. The rudder and stabilizer are adjusted before the takeoff.


CUT TO EXACT ANGLE SO THAT LOWER WING HAS 2 DEGREE INCIDENCE
NOTCH FOR LONGERON
9¼"
CARVE TO WING CURVE
1.4" X 6" SHEAR PIN SOCKET TUBE
FIG. 4
DETAIL OF THE LOWER WING LANDING
— MAKE 1 RIGHT & 1 LEFT —

The lower wings are attached to solid balsa stub pieces shown in Fig. 4 and photo above. Photo shows underside of fuselage. Note the slotted floor for the ignition battery box.



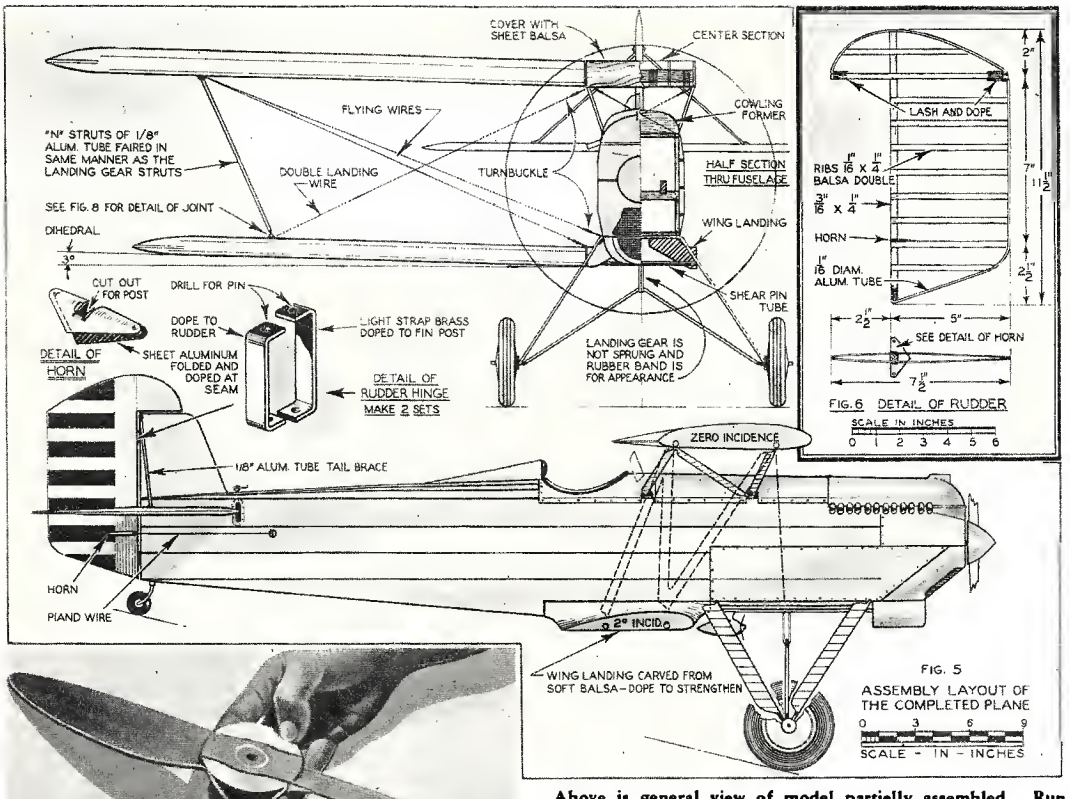
The stabilizer is assembled and fitted before covering fuselage. It is pivoted at main spar and moved up and down with the screw and nut shown here and in Figure 1 of Part I.

for those who prefer a steady flying somewhat slower job to a fast ship the larger span will commend itself. The centersection may also be increased to as much as a 12-inch span but in this event minor changes in the placing of the wing strut fittings will be necessary to avoid too wide a splay on the interplane struts.

The wings themselves are quite simple to build and dimensions as well as material are adequately specified in the drawings. Make full size layouts of each wing—right and left hand for each wing. On this layout put the spars, and over the spars set the ribs. These are doped to the spars and to the leading and trailing edge. The false ribs are next glued in, making sure the wing is square. Then the wing butt pieces are made up and glued on. The tips are of aluminum tubing doped to the edges. Notch the spars to fit the short pieces of ¼" aluminum tube which form the sockets for the shear pins. Cover the wing with airplane silk which should be given three coats of dope.

In setting up the wings and centersection remember that the upper wing has zero incidence while the lower is set at an angle of about 2 degrees. This latter is obtained by carving the lower wing landing fittings to accurate angle. Both wings are rigged with a three degree dihedral angle which will be found adequate for stability purposes and furthermore does not detract from the ap-

Flying Gas-Powered Model Plane Has Trim, Fast Lines of Pursuit Ship


COVER WITH SHEET BALSA
CENTER SECTION
FLYING WIRES
COWLING FORMER
"N" STRUTS OF 1/8" ALUM. TUBE FAIRED IN SAME MANNER AS THE LANDING GEAR STRUTS
DOUBLE LANDING WIRE
TURNBUCKLE
HALF SECTION THRU FUSELAGE
SEE FIG. 8 FOR DETAIL OF JOINT
DIHEDRAL
3°
WING LANDING
CUT OUT FOR POST
DRILL FOR PIN
SHEAR PIN TUBE
DOPE TO RUDDER
LIGHT STRAP BRASS DOPED TO FIN POST
DETAIL OF HORN
SHEET ALUMINUM FOLDED AND DOPED AT SEAM
DETAIL OF RUDDER HINGE MAKE 2 SETS
LANDING GEAR IS NOT SPRUNG AND RUBBER BAND IS FOR APPEARANCE
ZERO INCIDENCE
1/8" ALUM. TUBE TAIL BRACE
HORN
PIANO WIRE
2° INCID.
WING LANDING CARVED FROM SOFT BALSA—DOPE TO STRENGTHEN
LASH AND DOPE
RIBS 1/16 X 1/4 BALSA DOUBLE
3/16 X 1/4
HORN
1/16 DIAM. ALUM. TUBE
SEE DETAIL OF HORN
FIG. 6 DETAIL OF RUDDER
SCALE IN INCHES
0 1 2 3 4 5 6
FIG. 5
ASSEMBLY LAYOUT OF THE COMPLETED PLANE
0 3 6 9
SCALE - IN - INCHES

Above is general view of model partially assembled. Run light piano wire from rudder horn (Fig. 6) through corks shown in Fig. 1, Part I. The 14" propeller at left is commercial model prop recommended. Builder can carve own prop from pine; try 15" diameter with about 6" pitch.

pearance of the model—a common fault in many power-driven models.

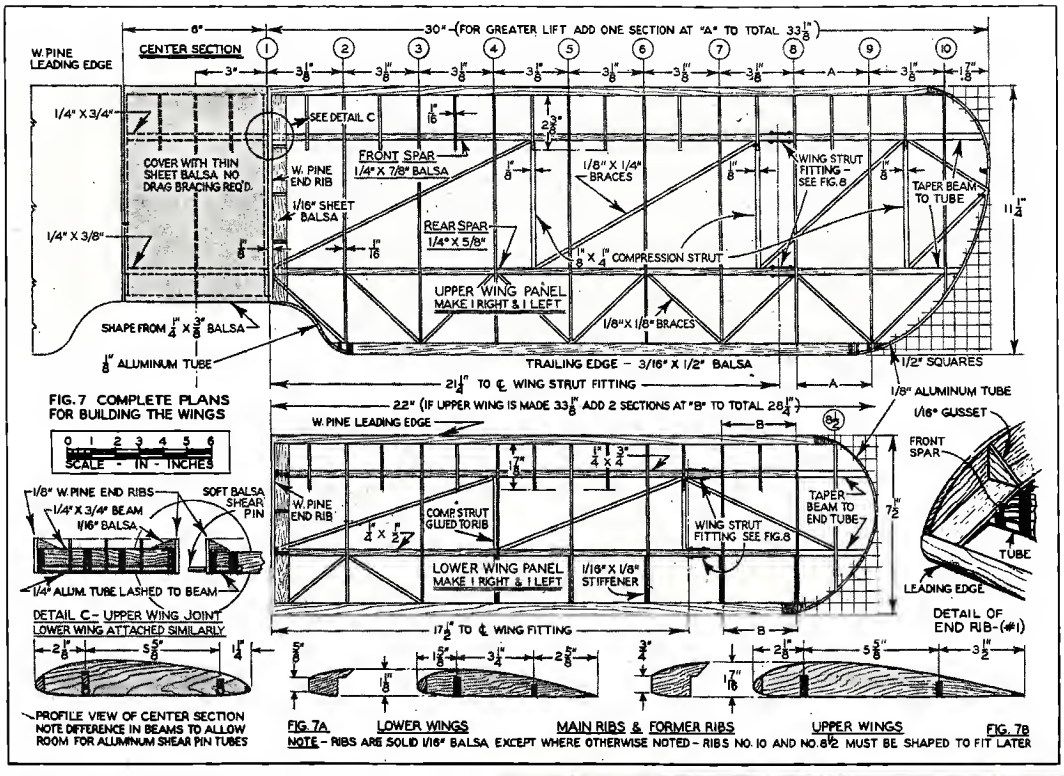
There are no ailerons. The dihedral is sufficient to maintain ordinary stability and the incidence adjuster on the tail takes care of fore and aft trim. Torque effect from the propeller is offset by setting the rudder to compensate for whatever turning effect is attributable to the propeller torque. Run the piano wire from the rudder horn through cork to hold rudder in set position.

The interplane struts which are made of ⅛" aluminum tube faired in the same way as the landing gear struts, are of the conventional "N" shape. They are attached to the wing plates by small cotter pins to which are also attached the flying and landing wires. Details of the joints are shown in Fig. 8 and are self-explanatory. Dimensions of the wing struts may be taken off the plans remembering to allow for the outward slant or splay of the struts and keeping the proper relation of the different angles of incidence of upper and lower wings in mind.

The flying wires are of light piano wire soldered to small turnbuckles such as are obtainable at most model houses. Single wires run up to each outer upper wing spar: a double landing wire runs from centersection to front lower wing spar. The centersection is likewise rigidly braced with piano wire and turnbuckles. Light piano wire hooks are attached to the centersection to hold the flying wires.

There is 2 degrees decalage in this design. That means that the lower wing is set at two degrees more than the zero incidence of the upper wing. This is common practice with big ships and works well with the Berliner Joyce model. The theory is that the lower wing, in event the model climbs too steeply, will build uplift faster than the top wing will, and being farther back, it will push up and nose the plane down. If the ship dives,

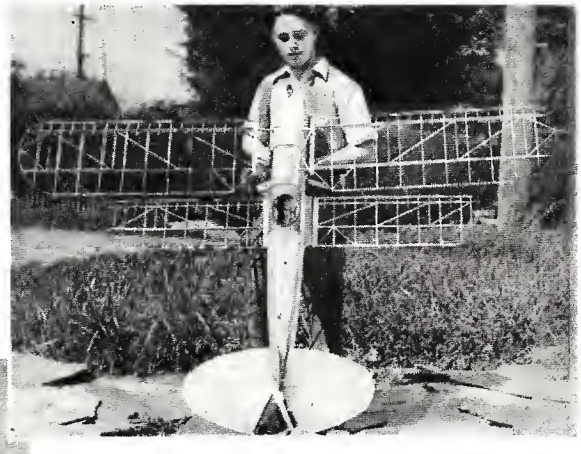
Model's Wings Can Be Lengthened to Increase Lift in High Altitudes


W. PINE LEADING EDGE
CENTER SECTION
30" (FOR GREATER LIFT ADD ONE SECTION AT "A" TO TOTAL 33⅛")
SEE DETAIL C
FRONT SPAR 1/4" X 7/8" BALSA
REAR SPAR 1/4" X 5/8"
W. PINE END RIB
1/16" SHEET BALSA
COVER WITH THIN SHEET BALSA. NO DRAG BRACING REQ'D.
1/8" X 1/4" BRACES
WING STRUT FITTING - SEE FIG. 8
TAPER BEAM TO TUBE
1/4" X 3/8"
1" X 1" COMPRESSION STRUT
UPPER WING PANEL MAKE 1 RIGHT & 1 LEFT
1/8" X 1/8" BRACES
SHAPE FROM 1/4" X 3/8" BALSA
1/8" ALUMINUM TUBE
TRAILING EDGE - 3/16" X 1/2" BALSA
1/2" SQUARES
21¼" TO ℄ WING STRUT FITTING
22" (IF UPPER WING IS MADE 33⅛" ADD 2 SECTIONS AT "B" TO TOTAL 28¼")
1/8" ALUMINUM TUBE
1/16" GUSSET
FRONT SPAR
TUBE
LEADING EDGE
DETAIL OF END RIB-(#1)
FIG. 7 COMPLETE PLANS FOR BUILDING THE WINGS
SCALE - IN - INCHES
1/8" W. PINE END RIBS
1/4" X 3/4" BEAM
1/16" BALSA
SOFT BALSA SHEAR PIN
1/4" ALUM. TUBE LASHED TO BEAM
DETAIL C - UPPER WING JOINT
LOWER WING ATTACHED SIMILARLY
W. PINE END RIB
COMP. STRUT GLUED TO RIB
TAPER BEAM TO END TUBE
WING STRUT FITTING SEE FIG. 8
LOWER WING PANEL MAKE 1 RIGHT & 1 LEFT
1/16" X 1/8" STIFFENER
17½" TO ℄ WING FITTING
PROFILE VIEW OF CENTER SECTION
NOTE DIFFERENCE IN BEAMS TO ALLOW ROOM FOR ALUMINUM SHEAR PIN TUBES
FIG. 7A
LOWER WINGS
MAIN RIBS & FORMER RIBS
UPPER WINGS
FIG. 7B
NOTE - RIBS ARE SOLID 1/16" BALSA EXCEPT WHERE OTHERWISE NOTED - RIBS NO. 10 AND NO. 8½ MUST BE SHAPED TO FIT LATER

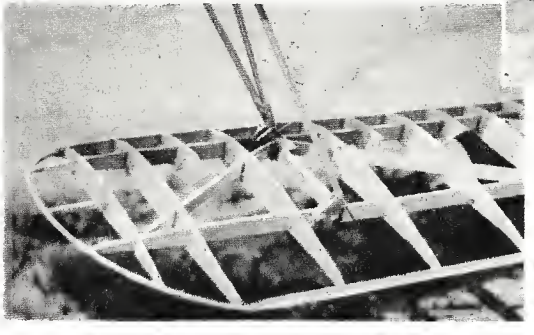
Complete wing construction is shown above. Center section is held to the fuselage with N struts shown in Fig. 1, Part I, which appeared in the August issue.

the center of lift of the upper wing travels forward rapidly, and tends to pull the nose up. Hence the plane itself, if you set the stabilizer at a slight lift angle, to take the load off it, will fly itself.

The motors used in model planes are extremely clever in design and come ready for flight. The motor bearers will be spaced the same distance as the little



Skeleton construction of all wings is plainly visible in this photograph. Lower wings are shown without aluminum ends.

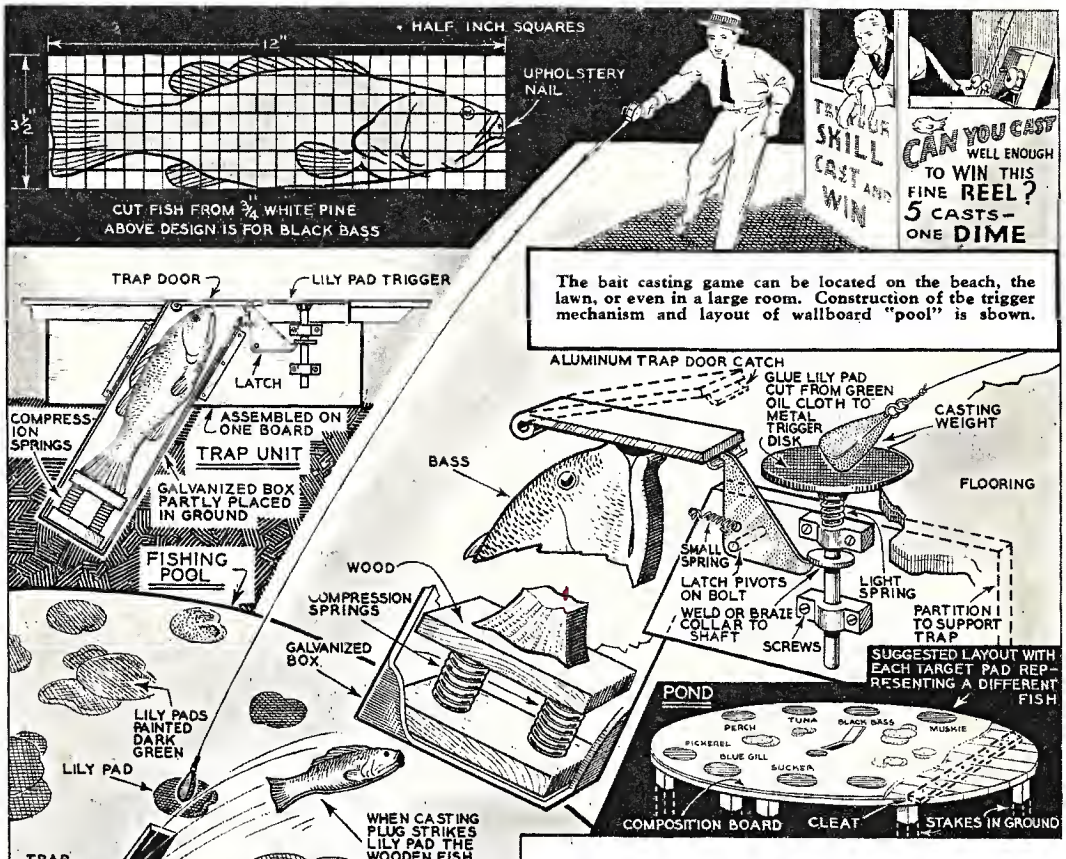


This closeup of the lower wing shows how strut fittings are fastened to the spar, and gives construction of the wing as well.

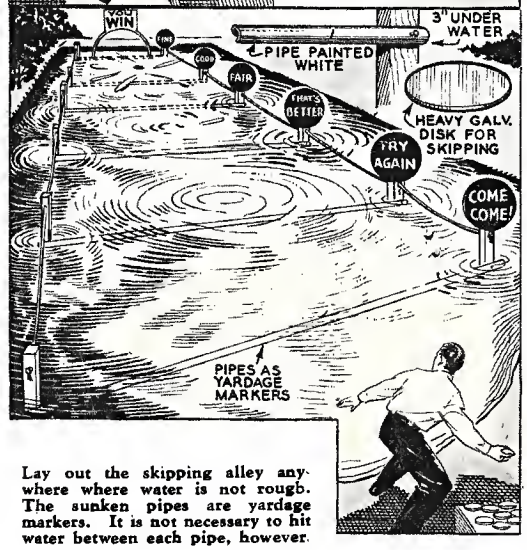
bearers in the box in which the motor comes. All you have to do is drill the holes for the motor base and the gas tank and screw them down. Small bolts hold the motor down, while screws will do for the gas tank. Be sure the motor shaft is centered on the thrust line. If it is to the right or left, it

[*Continued on page* 126]

Games of Skill Enliven Beach Carnivals



The bait casting game can be located on the beach, the lawn, or even in a large room. Construction of the trigger mechanism and layout of wallboard "pool" is shown.



Lay out the skipping alley anywhere where water is not rough. The sunken pipes are yardage markers. It is not necessary to hit water between each pipe, however.

BECAUSE few fishermen can resist a chance to show their prowess at bait casting, and because few outdoor fans can resist the lure of a stone skipping over the water, these two novel water games will prove money-makers at any beach carnival or fun fest. The equipment needed can be gathered and erected in a few hours if all the members of your club or church group pitch in.

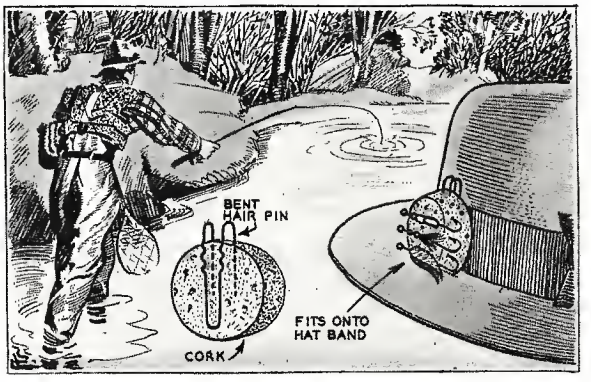
The central lily pad is the target in the bait casting game. A realistic wood fish is thrown into the air by a concealed trigger and spring mechanism when the pad is struck by the casting plug. The "pool" is of wallboard, making this game suited even for lawn or indoor use.

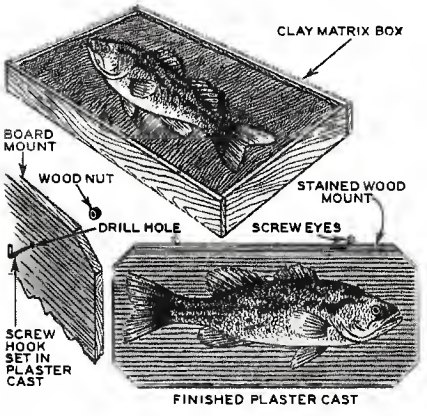
The "Skimmerskip" alley is laid out over calm water, with posts arranged as shown for markers. Prizes go to those who succeed in skipping a stone through the arch at the opposite end. As flat stones are scarce in most localities, heavy galvanized metal discs are used. These can be recovered with a long-handled rake.

FISHING SECRETS

Hat-Band Cork Holds Trout Flies

A CONVENIENT holder for small hooks and for flies may be made by inserting the points of a large hairpin into a flat cork, then bending the hairpin back to form a loop which slips behind the fisherman's hat-band. The holder with hooks is easily removed and placed back in the tackle box when fishing is over for the day. If many kinds of flies are being used, use several holders.—G. E. Hendrickson.



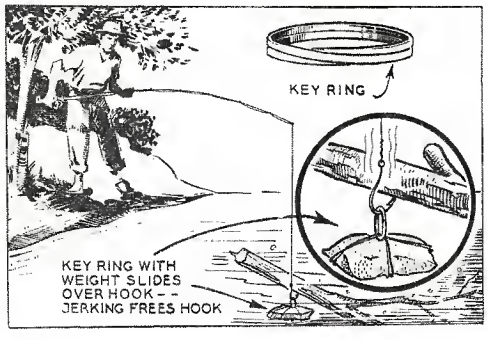


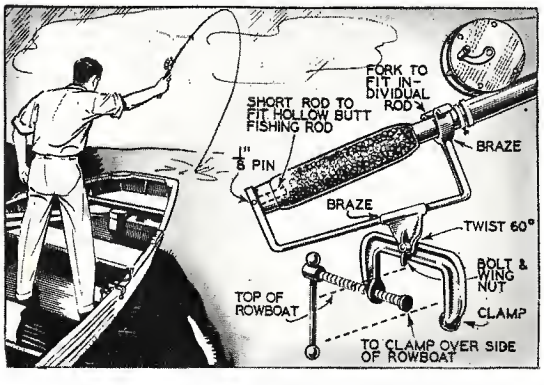
Make Plaster "Proofs" of That Big Fish

CARRY along a few pounds of plaster this summer on that vacation fishing trip, and bring back "proofs" in exact size and detail of that "big one" that didn't get away. The process is simple and takes only a few minutes. Locate some clay near camp, mix a quantity with water, then fill a box or pan about four inches deep and large enough to hold your fish. Press the fish into this matrix, with its side against the clay surface. Allow the clay to dry in the sun, then fill the mold with a plaster of Paris mixture. Press the heads of screw hooks into the plaster before it hardens, using these to mount the plaster trophy.—C. E. Van Horn.

How to Loosen Snagged Fish Hooks

WHEN fish hooks become snagged on sunken logs or branches, jerking on the line will in most cases serve merely to imbed the hook deeper. If, however, a rock or heavy lead sinker is allowed to slide down the line to the hook, a few gentle jerks on the line will serve to loosen the hook.—A. H. Waychoff.

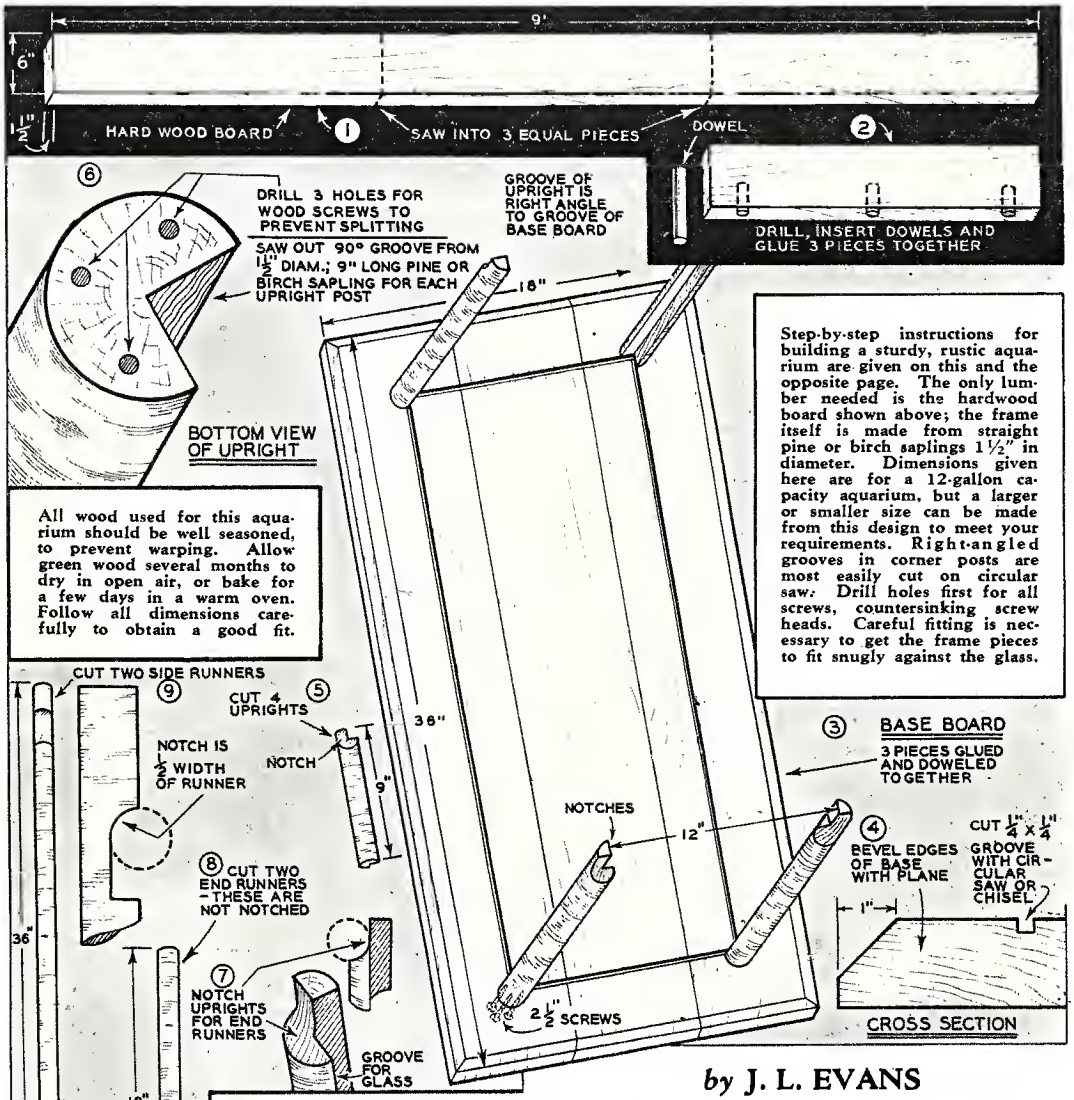




Put Rod in Holder When Trolling

HAVE you ever tried to hold a casting rod between your knees while trolling alone? For just such an occasion was this casting rod holder designed. A hole is drilled in the end of the rod, to fit over a short iron pin on the holder. Make the fork which grips the rod from spring steel.—L. W. Smith.

RUSTIC DESIGN Features


9"
6"
1½"
HARD WOOD BOARD
1
SAW INTO 3 EQUAL PIECES
DOWEL
2
DRILL, INSERT DOWELS AND GLUE 3 PIECES TOGETHER
6
DRILL 3 HOLES FOR WOOD SCREWS TO PREVENT SPLITTING
SAW OUT 90° GROOVE FROM 1½" DIAM.; 9" LONG PINE OR BIRCH SAPLING FOR EACH UPRIGHT POST
GROOVE OF UPRIGHT IS RIGHT ANGLE TO GROOVE OF BASE BOARD
18"
BOTTOM VIEW OF UPRIGHT
All wood used for this aquarium should be well seasoned, to prevent warping. Allow green wood several months to dry in open air, or bake for a few days in a warm oven. Follow all dimensions carefully to obtain a good fit.
Step-by-step instructions for building a sturdy, rustic aquarium are given on this and the opposite page. The only lumber needed is the hardwood board shown above; the frame itself is made from straight pine or birch saplings 1½" in diameter. Dimensions given here are for a 12-gallon capacity aquarium, but a larger or smaller size can be made from this design to meet your requirements. Right-angled grooves in corner posts are most easily cut on circular saw. Drill holes first for all screws, countersinking screw heads. Careful fitting is necessary to get the frame pieces to fit snugly against the glass.
CUT TWO SIDE RUNNERS
9
CUT 4 UPRIGHTS
5
NOTCH IS ½ WIDTH OF RUNNER
NOTCH
9"
36"
36"
3
BASE BOARD
3 PIECES GLUED AND DOWELED TOGETHER
NOTCHES
12"
4
CUT ¼" x ¼" GROOVE WITH CIRCULAR SAW OR CHISEL
BEVEL EDGES OF BASE WITH PLANE
1"
CROSS SECTION
8
CUT TWO END RUNNERS — THESE ARE NOT NOTCHED
7
NOTCH UPRIGHTS FOR END RUNNERS
GROOVE FOR GLASS
2½" SCREWS
18"
Ends of all cross-pieces extend 3" beyond aquarium glass. Side cross-pieces are level with aquarium top; end pieces are about 1" lower. All rest on the notched corner uprights.
10
END RUNNER
NOTCH SIDE RUNNER TO MAKE SNUG FIT THEN DRILL HOLES FOR ASSEMBLY SCREWS
SIDE RUNNER
SIDE RUNNER
END RUNNER
UPRIGHT
UPRIGHT

by **J. L. EVANS**

RUSTIC in appearance, this home aquarium filled with tiny fish, with chalky snails and clams, and with vivid green underwater plants creates a spot of interest in any home. Build one now as a place for those little creatures you have admired so much at nearby lakes and pools—watch these small fish and animals grow to maturity before your eyes, all through the summer, fall and winter.

The aquarium itself is simple to build and not at all expensive. The pieces of auto window glass, some hard wood, and the screws needed can be picked up for a few cents; the wooden framework can be cut on your vaca-

This HOME AQUARIUM

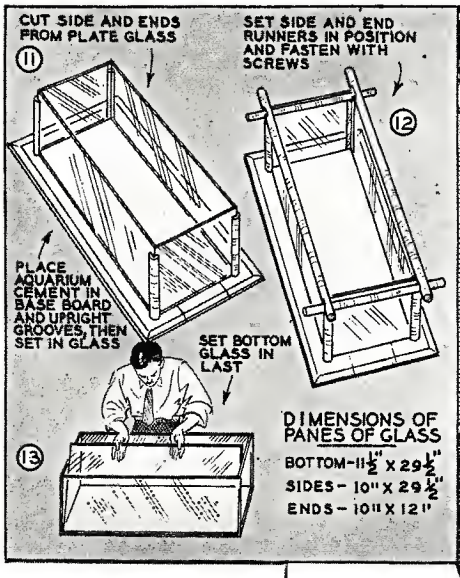
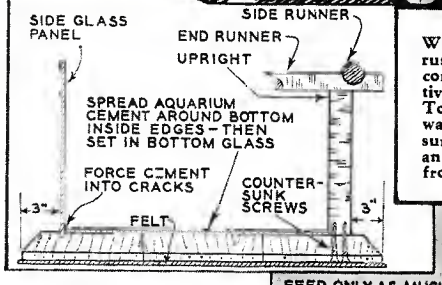

CUT SIDE AND ENDS FROM PLATE GLASS
11
SET SIDE AND END RUNNERS IN POSITION AND FASTEN WITH SCREWS
12
PLACE AQUARIUM CEMENT IN BASE BOARD AND UPRIGHT GROOVES, THEN SET IN GLASS
SET BOTTOM GLASS IN LAST
13
DIMENSIONS OF PANES OF GLASS
BOTTOM-11½" X 29½"
SIDES-10" X 29½"
ENDS-10" X 12"

Plate glass from automobile windows is ideal for an aquarium. Straight cuts are necessary, especially at the corners where a watertight joint is required. Aquarium cement will fill up the smaller cracks. Bottom glass is set in last. Cut all pieces to dimensions given, set up on baseboard, trace around inside and outside edges, then cut the ¼" deep grooves into which glass will fit, using a chisel or circular saw for routing.



With a varnished hardwood base and rustic paper birch frame pieces, the completed aquarium makes an attractive piece of furniture for any home. To avoid excessive growth of your water plants, place the aquarium where sunlight will strike it directly for only an hour or so each day. Light coming from above, as in nature, is the best.

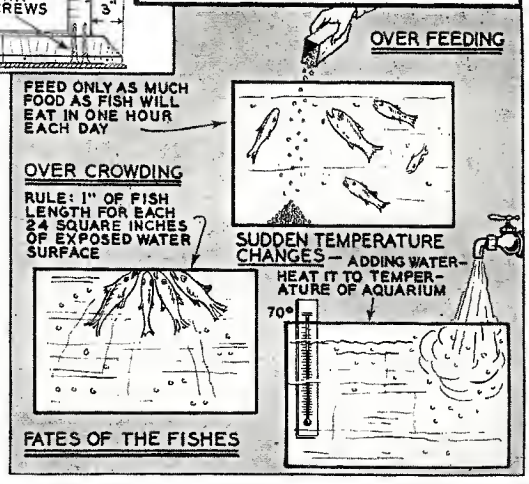
tion trip, if there are no suitable trees near your home. By following carefully the instructions given in the sketches for the construction of such an aquarium, you should have no difficulty in providing exactly the right living conditions for its inhabitants.

Aquarium cement is used to make watertight joints between the panes of glass and between the glass and the baseboard. This may be obtained at any pet shop, or may be made up at home.

Spread cement into the grooves in the baseboard, using only enough to fill the cracks when the glass is set in. Now assemble the aquarium piece by piece, applying cement to each joint and to the insides of the corner posts. Block up the glass from the inside to keep it in position until the cement hardens.

You still have one pane of glass left—this is to go on the bottom of the aquarium, and

[*Continued on page* 122]


OVER FEEDING
FEED ONLY AS MUCH FOOD AS FISH WILL EAT IN ONE HOUR EACH DAY
OVER CROWDING
RULE: 1" OF FISH LENGTH FOR EACH 24 SQUARE INCHES OF EXPOSED WATER SURFACE
SUDDEN TEMPERATURE CHANGES — ADDING WATER-HEAT IT TO TEMPERATURE OF AQUARIUM
70°
FATES OF THE FISHES

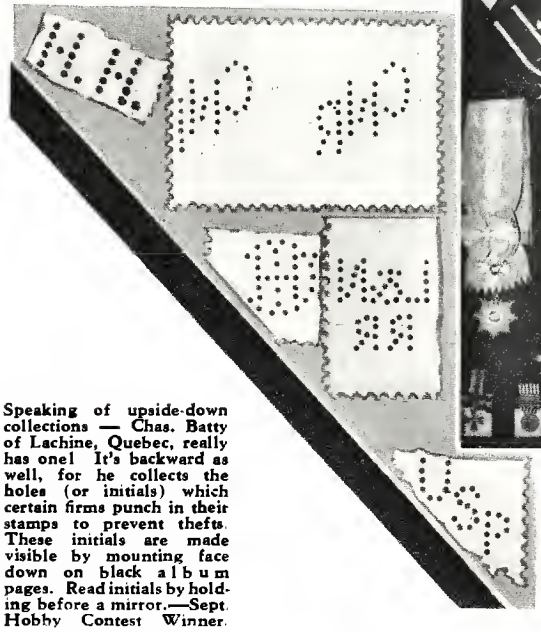
MAKING AQUARIUM CEMENT

Mix together 1 part white sand, 1 part plaster of Paris, 1 part litharge, and ⅓ part powdered resin, then add linseed oil and clear varnish slowly, carefully working in each small portion of oil. Add just enough oil, after the lumpy stage is reached, to make a stiff, smooth, and thick paste. This formula is recommended for its strength, permanence, and harmlessness to the aquarium inhabitants.

WITH THE COLLECTORS

A stamp collector's gold mine is this unique fan, made up of foreign letters received this year by the Los Angeles Chamber of Commerce. Collectors of covers might well consider this attractive method of mounting their less valuable specimens. Readers are invited to send in to the Hobby Editor photos of their collections mounted in unusual ways. There'll be $5 prizes for the best submitted.

Ha collects dog stones! Rudolph R. Zandall of Gary, Ind., wins $5 in this month's Hobby Contest for photos of his collection of stones resembling dog heads. Some of his stones are painted on ona side to bring out more fully the resemblance to a particular breed. A few of his most prized specimens are pictured above. Other stones resamble human heads, birds and animals. Some are in use as door stops, paper weights, and attic den ornaments.



Speaking of upside-down collections — Chas. Batty of Lachine, Quebec, really has one! It's backward as well, for he collects the holes (or initials) which certain firms punch in their stamps to prevent thefts. These initials are made visible by mounting face down on black album pages. Read initials by holding before a mirror.—Sept. Hobby Contest Winner.

Here are a few specimens from the collection of medals formed by J. I. Schnitzer of Hollywood. This collection, representing 20 years of work, has an estimated value of $75,000, and is believed to be the world's greatest. The owner is pictured above pointing to the Serbian order White Eagle, a duplicate of the medal worn by King Alexander of Yugoslavia at the time of his assassination. Many motion picture companies rent duplicates of his medals for movie films. At upper right is the Croix de Guerre.

New INVENTION SAVES GAS!

3 TO 7 MILES MORE PER GALLON

MOTORIST SAVES $180.00 a YEAR

Saves up to Thirty Per Cent On Gas.
Provides Faster Pick-Up---More Power---
Greater Mileage and Smoother Running.

GET FREE INFORMATION

CHRYSLER
Have tried the Vacu-matic and it sure is fine. Better pick-up with a 30% gas saving.—John C. Martin, Pa.

PLYMOUTH
I am amazed at Vacu-matic performance. It's giving me 5 more miles per gallon.—Walter Zielinski, Ill.

V-8 FORD
I installed both Vacu-matics and they work excellent. On my own V8 Ford I notice wonderful performance in pickup, get-away and gas saving. — Burt Burnett, Mich.

BUICK
Everything you claim about Vacu matic is true. I now get 20 miles to the gallon. Before I was only averaging 15½ miles.— C. Constantino, Fla.

FRANKLIN
With Vacu-matic I have increased my mileage from 10.1 to 14.2 miles per gallon. I figure I save over $75.00 a year in gasoline. R. K. Radtke. Wis.

SAVES $180 A YEAR
On my Plymouth 6 I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of $15 a month or $180 a year. F S. Peck, Calif.

CHEVROLET
Please send me a Vacu-matic for a Model A. The mileage on my 1933 Chevrolet jumped from 18 to 22 miles per gal. with Vacu-matic. — Paul P Haas, Mass.

ALL WELL PLEASED
Enclosed find order for 12 more. Everyone I have sold is giving from 4 to 6 more miles per gallon. I have 3 more orders for V8 Ford. Every body is well pleased.—J. O. Carll, Texas.

MODEL A FORD
Have been using the Vacu-matic for a month. I used to get 20 to 22 miles per gal. Now I get 30 to 33 miles. It is amazing the difference it makes.—James W. Barr, Canada.

NASH
On my Advanced 6 Nash gained 17½% in mileage. The car will idle down to 3 miles an hour and then take gas without a complaint. — J. Showalter, Mo.

DODGE
Just completed 2310 miles on 92 gallons in my 1933 Dodge 6. This figures 25 miles while before I averaged only 20 miles per gal. on trips. — Al Fruzyna, Calif.

OLDSMOBILE
I am well pleased with Vacu-matic on our Oldsmobile. A test proved it to give 18 miles per gal. Before we considered 13 good. — Arthur Williams, N. Y.

Above are just a few of the many unsolicited letters received from Vacu-matic users.

VACU-MATIC

PATENT PENDING

the Carburetor Control that "BREATHES"

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, greater speed and smoother running

New- *Automatic*- Nothing Like It!

The self-starter—four wheel brakes—knee action—streamlining . . . and now VACU-MATIC! The greatest motor improvement of recent years! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds. Vacu-matic is *entirely different!* It is AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. Just put it on and forget it! Sharply cuts fuel wastes, saves dollars in gas costs, reduces carbon and gives your engine new pep, greater power and longer life.

Agents and Salesmen
If you are interested in earning unusual profits, check coupon. Exclusive territories are now being granted.

Fits All Cars

VACU-MATIC is constructed of six parts, assembled and welded into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

The VACU-MATIC Co., Wauwatosa, Wis.

Guaranteed Gas Savings

The VACU-MATIC proves itself on every car. It is guaranteed to give worth-while gas savings, quicker pick-up, and more power or it costs you nothing. "On a test I gained an average of 4 miles on a gallon," writes Alex Wertz. "Vacu-matic is the best I have ever tried." Clarence Rutzin—"I have tried the Vacu-matic on several tests and find that I get between 5 and 6 miles per gallon increase, have more mileage, have greater pickup."

Free Details

Learn about this remarkable device that so greatly affects the entire performance of your motor. Learn why your car is costing you extra money to operate without VACU-MATIC. See why your VACU-MATIC equipped car will leap away from traffic without sputter or hesitation. Discover a new driving thrill and enjoy the savings. Get the facts! Write today!

FREE OFFER COUPON

THE VACU-MATIC COMPANY
7617-111 W. State St., Wauwatosa, Wis.

Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

Name.....

Address.....

City..... State.....

☐ Check here if interested in selling proposition.

Stamp Beauty Contest Winners

UNITED STATES stamps carried off the greatest number of awards in a beauty contest conducted by Gibbons' Stamp Monthly of London, England to determine the most beautiful stamp designs issued in 1934.

The Mother's Day, three-cent and one-cent National Parks stamps took third, eighth and ninth places in the competition. Canada's Jacques Cartier stamp, an illustration of which appeared on page 116 of the October, 1934 issue of MM, received first honors.

In another contest the U. S. $1 jet black stamp of the 1898 trans-Mississippi issue showing "Western Cattle in a Storm" was declared the world's most beautiful stamp.

The correct address of George W. Hester, who in the August issue offered to obtain unusual postmarks for MM readers who sent him stamped, self-addressed envelopes and forwarding postage, is P. O. Box 94, Morristown, New Jersey. Letters addressed to North Carolina will undoubtedly be returned.

Catch Fish the Natural Way

[*Continued from page 77*]

can turn your line when one taper looks worn and use the other. It is customary to apply a core of cheap silk line on the reel barrel to build it up, before putting on the fly line. For a rod of 8½ to 9 feet, and a weight of 4½ to 5 ounces, which is moderately stiff, the size HEH line is selected. If the rod is possessed of some little backbone, the HDH line is often used. For ordinary work one would do well to select the former.

By having a tapered line the leader, when joined to the line, will be more nearly alike in thickness and will cast smoothly.

The gut leader in dry fly fishing, should be one of fine caliber and an unusual degree of invisibility. Just as the line is tapered, so also is the gut leader tapered. The leader for dry fly work should be the usual 7½-foot length. Some prefer a longer leader (the 9-foot length). Leaders, whether used in wet fly fishing or dry fly work, must be limp and well soaked before they are used.

In wet fly fishing the line and leader sinks as the fly is fished under the water. In dry

[*Continued on page 118*]

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

YOU'VE Tried the rest—now get the best! "Challenge Collection" including Cape Goodhope, Triangle, Thessaly Octagonal, Commemoratives—10c with approvals. Free airmail Collection, additional premiums given regular customers. Bargain Stamp Service, 905 West Fifth, Los Angeles, California.

IF YOU are a serious collector of the better grade of stamps my approvals will interest you. Send 25c for my introductory selection, and receive stamps cataloging over $1.50. References must accompany approval requests. Address F. Stein, Dept. 212, 7360 N. Seeley Ave., Chicago.

MAMMOTH Mystery Packet rare stamps only 10c to serious approval applicants, also valuable free premiums with every selection afterwards. Our stamps are better, our service is different. Fair-Play Stamp Service, 1215 Browning Blvd., Los Angeles, Calif.

1897 NEWFOUNDLAND Cabot Commemorative Cataloging 25c, exotic Brunei, $5. U. S., Turks Caicos, genuine Baden, Imperforate "Park"—Everything 5c with Approvals! Viking Stamp Co., 1 Hanson Pl., Brooklyn, N. Y.

BRITISH TURKISLANDS—Also Congo's—Montecarlo—Nigercoast—Uganda—Djibouti—Eucadorian—Ivorycoast—Ubangi—Countries collectors need. Free for 5c postage. Empirestampshop, Dept. M.M., Toronto, Canada.

WATERFALLS-REUNION Complete mint set #127-32 for only 10c to approval applicants. GIVEN free "THE FIERY THRONE." Tristate Stamp Co., Box 91, Dept. M, Weirton, W. Va.

ASCENSION, Grenada, Pictorial Commemoratives, including other scarce islands 10c. Provided you desire approvals. Grandstamps, 919 South Grand, Los Angeles, California.

SCARCE Ecuador Airmail in Gigantic packet, 104 different Congo, Hyderabad, Guinea, etc., 5c to approval applicants. Hunziker Box 225-A, Minneapolis, Minn.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

SENSATION: Airmails from 10 countries; U. S., South America; Pictorials 10c. A. Steele. Springdale, Pa.

FREE—25 Different United States Stamps to approval applicants. Brownie Stamp Shop, Flint, Michigan.

100 FOREIGN POSTAGE STAMPS, all different, one dime. P. Miller, 211 Reisinger, Dayton, Ohio.

STAMPS Sent on approval. 50% discount. Fred Herzberg, 197 Grantley Ave., Elmhurst, Illinois.

BARGAINS Galore. Penny approvals. Thousands to choose from. Flood, Clinton, Michigan.

FREE!!! Russia Ethnographic Set. Postage 3c. Roberts, 901T Fourth. Baycity, Michigan.

BIG Stamp Magazine, 13 Weeks, 10c. Chambers Weekly, Kalamazoo, Michigan.

COINS

$5.00 TO $500.00 EACH paid for Old Coins. Keep all old money. Get posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. Coin Exchange, Box 17, Le Roy, N. Y.

MARYLAND, Kentucky, Texas, Commemorative $½s, $1.50 ea. White cent and selling Catalogue, 10c. Buying list cents. 10c. Norman Shultz. Salt Lake, Utah.

WE PURCHASE All Indianhead Pennies and valuable coins. Purchasing catalogues, 10c. Fairbanks, Department Twenty-one, 287 Broadway, New York.

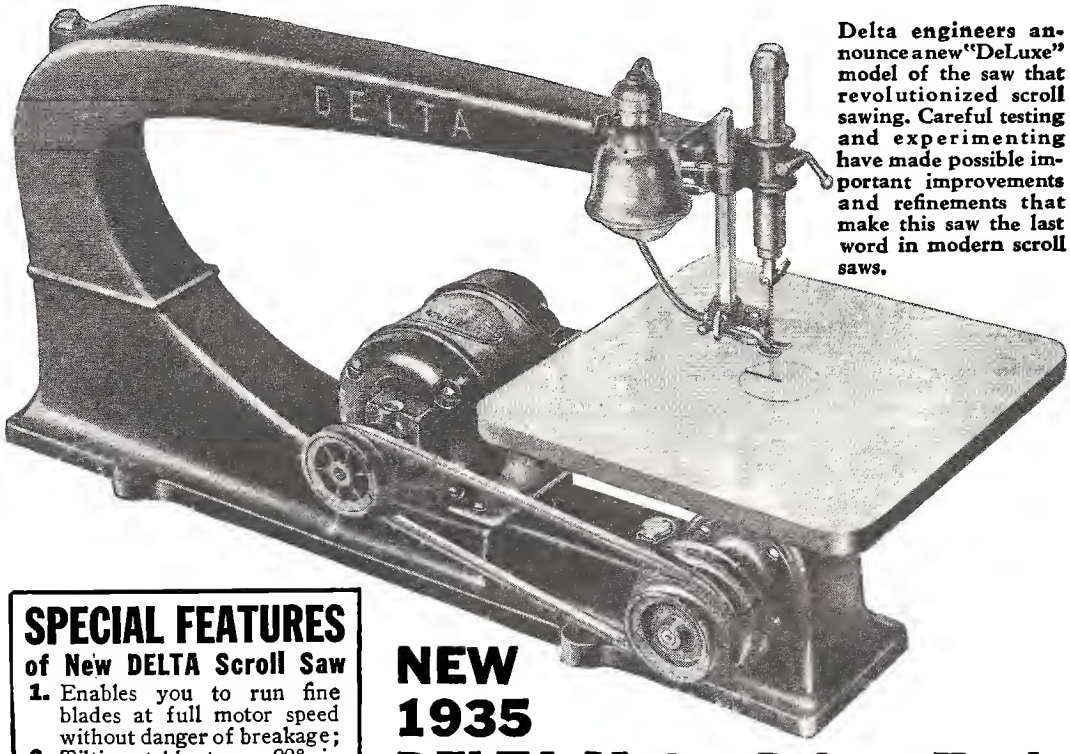
$$$ FOR Pennies! $50 each for Indian heads! $2 each for Lincolns! 10c brings buying catalog. Nationwide Coin Exchange, 130-Y West 42nd, New York.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

OLD MONEY Wanted. $5.00 to $2,500.00 each paid for old coins. Buying catalog 10c. Robert Cohen, Box 483, Muskogee, Okla.

New Scroll Saw

Offers Amazing Performance and Efficiency



Delta engineers announce a new "DeLuxe" model of the saw that revolutionized scroll sawing. Careful testing and experimenting have made possible important improvements and refinements that make this saw the last word in modern scroll saws.

SPECIAL FEATURES
of New DELTA Scroll Saw

1. Enables you to run fine blades at full motor speed without danger of breakage;
2. Tilting table turns 90° in either direction;
3. Adjustable blade tension;
4. Two convenient guide positions for sawing from front or side of machine;
5. Four speeds without moving motor;

and many other novel and useful features.

NEW 1935 DELTA Motor-Driven Tools

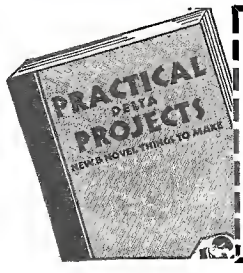
The new "DeLuxe" Scroll Saw is but one of the many new improvements and tools announced this year by Delta engineers. This year the Delta line of motor-driven woodworking tools is more complete than ever before. Delta standards of efficiency, quality, and convenience have been strictly maintained—and Delta prices still kept at their low levels. Good compact motor-driven tools are within the reach of all. Every woodworker will find the new 1935 Delta line of unusual interest.

Send for CATALOG

The 1935 catalog of Delta quality motor-driven tools is now off the press. It is crowded with photographs and information about the new line of 1935 Delta tools. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all. Send coupon so your name will be placed on the mailing list to receive the 1935 Delta catalog without delay. Enclose only 10 cents at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make with many blue prints, working drawings, photographs and illustrations—and complete directions.

NEW BOOK for WOODWORKERS

32-page book "Practical Delta Projects"—crowded with new and "out of the ordinary" things to make—with many photographs, working drawings, and easy-to-understand illustrations. Simple, complete instructions make every project easy to follow. Every woodworker should have this book. Send 10c with coupon. 1935 Delta catalog mailed postpaid.



DELTA MANUFACTURING CO.,
3775 N. Holton St., Milwaukee, Wis., Dept. M-935

I enclose 10c (stamps or coin), for which please send me one copy of "Practical Delta Projects". Also place me on your mailing list to receive 1935 Delta catalog of quality motor-driven woodworking tools.

Name .....Age?.....

Address .....

City ..... State.....

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To prove you can learn Civil Engineering at home in your spare time. And because no description here could do it justice, to let you see for yourself the scope and simplicity, the authority and quality of this great home reading course. Cost and terms are within your reach. *Send no money*—just mail the coupon.

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"Civil engineers are wanted NOW. Enormous amounts are being spent in all kinds of public works and not a dime is spent until the Engineer has prepared plans. Then **He** must direct the work. It's a big job and there are not enough men to go around. Everywhere you go, you see road work going on—water and sewer systems being built—vast projects of all kinds. Here is **Your Opportunity** to get the necessary training right at home. These books are complete and simply written so anyone can understand them. Start now on our FREE examination plan. Mail the coupon without obligation.

American Technical Society
Drexel at 58th St., Dept. C6320, Chicago

American Technical Society,
Drexel at 58th St., Dept. C6320, Chicago
I want to examine the CIVIL ENGINEERING Cyclopedia for 10 days FREE. I will gladly pay the few cents express, but I am to pay nothing for the 7 big volumes if I return them within 10 days. If I wish to keep them I will send you $2 after the 10 days, then $3 a month until special advertising price $29.80 is paid. Send latest Edition.

Name .....

Address .....
(Attach letter stating age, occupation, employer's name and address)

NERVOUS? ARE YOU WORRIED? UNHAPPY?

What's wrong with you? Do symptoms of **Constipation, Indigestion, Dizzy Spells, Sweating** and **Sleeplessness** keep you irritable, exhausted and gloomy? Are you Bashful? Despondent? *There's Help for You!* Medicines, tonics or Drugs probably will not relieve your weak, sick nerves. My wonderful book *"Watch Your Nerves"*, explains a new method that will help you regain lost vitality and healthy nerves. Send 25c for this amazing book. **ROBERT HOLMES, 139 Fuller Bldg., Jersey City, N. J.**

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Big Pay for Trained Diesel Men

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BUSES
POWER PLANTS
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ENROLL WITH HEMPHILL—America's original and largest DIESEL TRAINING SCHOOLS! An exclusive, proven method. Latest-type DIESEL engines. HEMPHILL TRAINING will qualify you for responsible DIESEL positions. World's most thorough training at lowest possible cost.

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NEW YORK	CHICAGO	LOS ANGELES	SEATTLE
1329 Queen's Blvd., Long Island City, N.Y.	1253 Diversey Parkway	2120 San Fernando Road	509 Westlake No.

Detroit, 2340 Lafayette Boulevard
Vancouver, B. C., 1365 Granville Street

Sidetracking the Mighty Columbia

[*Continued from page* 75]

of contractors under the corporation name of the Mason-Walsh-Atkinson-Kier Company, or "MWAK," is constructing the first, or $63,000,000 unit, of the Grand Coulee.

What method of handling the river had the MWAK decided on that enabled them to bid low enough to get the contract?

Their plan is now public and it involves no system of diversion tunnels in the hills, but does call for a great series of cofferdams.

The first cofferdam, on the west bank, will be as large as the famous Muscle Shoals dam. Between this and a smaller cofferdam on the east bank of the Columbia will be a 700-foot channel for the river.

Behind these cofferdams, excavations will be made, and, extending out from each, the two concrete ends of the permanent dam will be erected. Openings or tunnels with control gates will be left in each section.

With the two portions finished, a third cofferdam will be built across the center channel of the Columbia upstream from the big dam, and a fourth cofferdam below.

The west and east bank cofferdams will then be removed, and with the center channel closed, the Columbia will be forced through the concrete tunnels left open in the finished portions of the dam. The central part of the dam can then be built.

Catch Fish the Natural Way

[*Continued from page* 116]

fly fishing the fly floats, and is fished on the water surface, therefore if the line should sink the fly would be pulled under. To offset this happening, the line is rubbed down with a line dressing which causes it to float on the surface, and makes it possible to pick it up with ease from the water. The leader is also rubbed down with the line dressing, all except the last two strands or two feet back of the fly. If the leader is greased up to the fly it will ride stiff and unnatural on the water.

The fly is also waterproofed with a fly dressing. Unless the fly floats in a natural manner the lure loses much of its value, for after all you are imitating the natural fly with your artificial counterpart. The fly dressing demands that you let the flies dry well after oiling them to get the best results.

In fishing the dry fly, one fly is used at the tip-end of the leader, not two or three as is often the case in wet fly fishing. The fly is cast to a vulnerable spot, is picked up and cast to another. Should it show signs of sinking, it needs to be dried, which is accomplished by what is known as "false casts." To do this the fly is cast forward over the water two or three times without letting it drop, after which,

[*Continued on page* 120]

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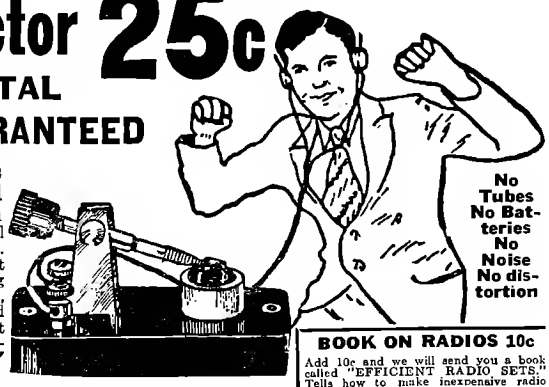

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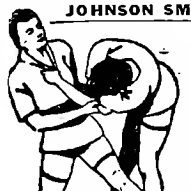

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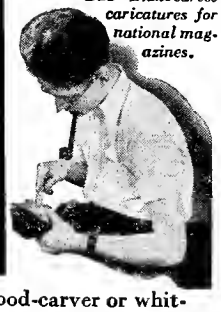

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Catch Fish the Natural Way

[*Continued from page* 118]

being dry, it is returned to the spot desired.

Dry flies do not have snells as is the case with many wet flies. They are rather what is known as the "eyed" fly, and they are tied to the end of the leader. Dry flies are generally the smallest of the flies used in trout fishing, being tied to No. 12, 13 and 14 hooks. Just as there are hundreds of patterns of wet flies, so are there numerous patterns of the dry fly to select from.

As compared to wet fly fishing, the dry fly method is one that is not only effective, but one that comes as close to "playing natural" as one encounters in any branch of the fishing pastime. Very simply, you observe the flies hatching on the stream bottom and making their appearance, here and there, on the water, or which may be fluttering close to the surface or are suspended on the foliage overhanging the stream. You then pick from your fly box some dry fly out of your collection that answers to it as nearly as possible in coloration and form.

It is often the case that trout, bass, and the smaller pan fish rise on the waters in the late afternoon or evening. There will be rises seen here and there, giving evidence of feeding fish. There is a school of dry fly fishermen who will only fish over rising fish, and the method is known as "fishing the rise."

It's Easy to Make Your Own Sails

[*Continued from page* 93]

punched through the tack and clew reinforcements for lashings. Lay a brass or galvanized iron ring over the edge of the hole. Using nine or ten ply roping twine rubbed with beeswax, sew the ring in place as illustrated in Fig. 3.

Use only 3/8" tarred hemp or manila for the bolt-rope. Rat-tail the end of the rope by trimming the strands until they taper to nothing. Twist the tapered ends and begin sewing it along the leach, a foot above the clew, with the standing part leading around the clew. Sew under one strand of the rope only, and bring the needle through the sail one-half inch from the edge. Stitches are about a half-inch apart. The weather-proofed rope is sewed continuously around the clew, tack and peak. It ends two feet below the peak with a rat-tailed end. *No roping is necessary along the leach.*

If slides are not used, punch 3/8" holes for brass eyelets, at the same intervals. Hardware stores have equipment for inserting these eyelets.

When setting sail, see that it is stretched without wrinkles. If the sails seem undersize, they will stretch to the proper dimensions after a little usage.

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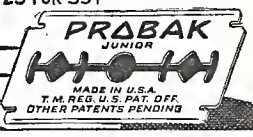

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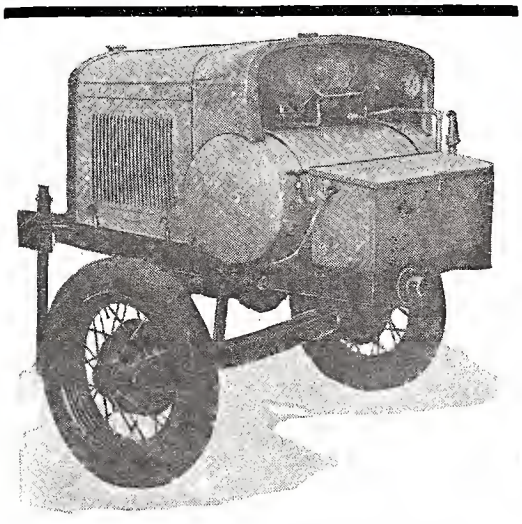

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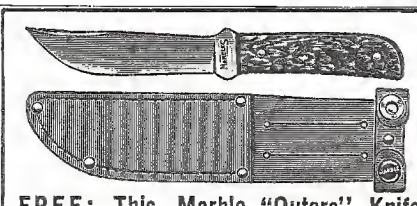

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Watch Fish Grow in This Aquarium

[*Continued from page* 113]

should fit in snugly. Place a layer of aquarium cement all around the inside edges of the baseboard and on the ends of the glass pane being set in. Now allow the tank at least 48 hours to dry.

When the aquarium has been cleaned and washed, place in a 2" layer of sand or gravel.

Pour water into the aquarium to a depth of about six inches, then put in the plants, pressing their roots firmly into place.

Plants which generally give best results in a home aquarium are *Vallisneria* (eelgrass) and *Elodea* (water weed). Various other plants found in ponds and slow streams may also be used.

In stocking the aquarium use only those animals which live in quiet pools and lakes, not in running water. Sticklebacks, mud minnows, and shiners are good ones with which to start.

About a dozen small snails may be kept in the tank. Snails are valuable as scavengers, and also keep the glass free of the green algae.

Clams should be small, and there should not be more than one per gallon of water.

The snails and clams will provide their own food, as they live mostly upon plants. Most of the other occupants may be fed small amounts of finely chopped raw meat, or small insects; raw beef is taken readily by fish.

Chandu Reveals His Magic Secrets

[*Continued from page* 56]

cloth over the table, seemingly all in one slow movement. The secret of this is to keep the spectators' eyes on *him* and not on the table. When they glance again at the table, they fail to notice its reduced height.

This next one is an old standby—the magic cabinet trick. The frame of a shallow cabinet three feet square is produced. Through holes bored in the three-inch wide closed sides two wooden rods are thrust through, to further prove the cabinet is open. There is no room anywhere to conceal anything.

Two open frames are brought forth, and hooked over the front and rear of the cabinet. A paste brush is applied to the rear frame, and a piece of paper pasted over it, closing it. The front frame is treated likewise. The cabinet is now covered, front and back, with paper.

Chandu's magic wand strikes the front paper, tears it, and pulls out a fair-sized canary cage with a *live bird in it!* The cage is about six inches square and deep—twice too large to even fit in the cabinet.

The trick is simple. A drop leaf in the top falls down when a pin is pulled (remember the last time he pulled the rods out and re-

[*Continued on page* 133]

Seeking Poison Fangs of Snakes

[*Continued from page* 51]

sacks. In a minute or two only his head and a short length of him remained outside.

By chance, the keeper looked up. My glance followed his amazed stare. There, on a pile of packing cases that overshadowed us, was the other cobra.

"Let go," I ordered and we both released our hold. It was a desperate chance, but the odds were that the captured snake would withdraw his head into the darkness of the sack before striking.

He did. I caught the open end of the sack, gave it a quick twist, left it on the floor.

Scrambling up from a kneeling position, I found the keeper had pinned the female's writhing body to the side of a crate with a skillful lunge. I adjusted the noose, stepped closer—then jumped away.

The infuriated reptile had jerked loose, struck at me.

Right then I made up my mind to take no further chances. The snake in the bag might work free any instant, and against a deliberate attack by two of them, our chances would not be good. I decided to bludgeon the female to death.

This horned rattlesnake is found along the Mexican border. It is rare, and seldom exceeds five feet in length. It is often confused with the sidewinder rattlesnake.

But at that instant the courageous keeper got the cobra pinned down again. This time I got the noose in place. Before sacking the female I tied the other bag, much relieved to find our first captive still safe.

America's Poisonous Snakes

Contrary to popular opinion, there are only four deadly types of snakes in this country: rattlesnake, copperhead, water moccasin and coral snake.

There are, of course, a dozen species of rattler, several kinds of copperheads, and two species of coral snakes.

The small, brightly-banded coral snake occurs in the United States only in the southmost portion. This snake is the only serpent that does not strike. It deliberately bites.

Scorpions, centipedes and tarantulas represent the other forms of poisonous creatures on this continent. I do not consider any of these three deadly, if the person bitten is in good health.

But do not flirt with a scorpion. Its sting is the most severe form of pain a poisonous creature—snake or insect—is able to inflict. Treatment for stings of all three is the same. In-

[*Continued on page* 127]

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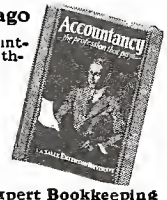

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The Gas-Powered Model Takes Off!

[*Continued from page* 101]

will give the ship a bad right or left rudder.

When everything is in readiness, select a calm morning and as large an airfield as you can. Usually before breakfast there are no gusts. It is better to tune the motor up in this weather, for the plane can be flown in ordinary breezes when the adjustments are made.

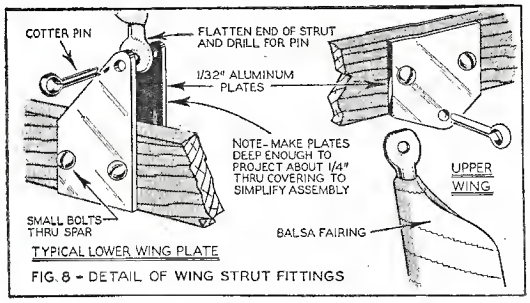
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FIG. 8 - DETAIL OF WING STRUT FITTINGS

Cut the plates from aluminum and fasten to the spar as shown. Struts are faired in same manner as landing gear in Part I.

Set the plane up, and without trying to run the motor, proceed to make adjustments for incidence and weight balance. You can tell pretty nearly how the plane should balance as to weights beforehand. The plane should balance with the finger tips held about ¼ the chord distance from the leading edge of the upper center section. Always leave the plane slightly nose heavy, so it will glide when the power is shut off.

Now grasp the plane lightly by the rudder post between the thumb and forefinger, head it up wind and run with it with the thrust line as nearly parallel to the ground as you can. At a brisk run the plane will want to fly. As soon as it takes off, let go, and observe what it does. Usually it will turn to the right or the left, and the rudder will have to be compensated ever so slightly to correct this. The ideal condition for the stabilizer is that it shall support its own weight, thus keeping the tail off the ground until the wheels touch. If the plane noses down after take off, you have too much tail incidence. If you don't have enough, the weight of the tail will throw the tail down and the plane will climb steeply, stalling into a power spin when about ten feet off the ground when the motor is running.

Always, send the plane off directly into the wind. One or two trials of the run and float variety can be followed with a motor test.

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Seeking Poison Fangs of Snakes

[*Continued from page* 125]

cision of the wound to promote bleeding, drawing out of the poison with a suction cup, and the local application of ordinary laundry soap. The soap should be shaved fine and mixed with water until it is a foamy paste.

Snake Catching Advice—"Don't"

My advice to novices who desire to know the proper way to catch poisonous snakes is: Don't do it!

A poisonous serpent is devilish in temper and keenly aware of its power. Any slip in handling such a specimen will be seized as an opportunity for a snap and lunge on the reptile's part. Too, a rattlesnake does not always sound his warning before striking.

The African, or spitting cobra, presents difficulties in photographing. Their venom is spat from the mouth in a thin stream and blinds if it falls on the eye. Too, it may be absorbed with dangerous effect by mucous membrane, even the lips. I wear goggles when photographing this serpent, and several times have observed the venom on the glass when removing them.

If such creatures are dangerous—and believe me, they are—why go to the expense, danger and labor of collecting them?

A naturalist's reason comes first. Perhaps only a naturalist can understand how important it is to classify all species of life.

Another good reason is that snake venom is valuable to science.

Not from a dollar and cents angle—although it is expensive—but venom is valuable in medicinal research and for immunizing horses from which the life-saving anti-toxin for snake bite is developed.

At the present time I am "milking" the poison from twenty-four water moccasins every two weeks. This venom, in a very dilute form, is being administered to victims of bleeding diseases with successful results in a New York hospital.

Venom of the cobra-mamba type has been used with some success in the treatment of certain malignant growths, including cancer.

I do not want to hold out that this is a cure for cancer. The process is still experimental, although some cures are reported.

Secrets of Snake Charming

What about snake charmers, do they really charm snakes?

The question is often asked and my answer is: "Yes."

Hindu and Arab snake charmers are usually descendents of families in which snake handling is an art. All their secrets are not known, but some men appear to have a remarkable influence over serpents.

[*Continued on page* 129]

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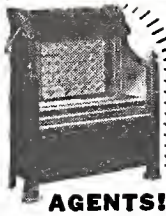

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Diving for Abalones

[*Continued from page* 79]

lower legs up and out of the water and descends sharply. The weight of the legs in the air will drive the diver's body quickly and without effort to a depth of eight or ten feet. The abalones are attached to the sides of rocks, often in broad crevices.

The prying instrument must be inserted between the rock and the abalone with a quick movement, or the mollusk, feeling the metal, will adhere so tightly to its habitat surface that the diver may be unable to loosen it during the brief period while he holds his breath. After he has brought his catch to the surface he simply permits it to attach itself to the top surface of his surf board, and the game is secure while he dives for another specimen.

On the west coast there are four important species of abalones: the red, which is ordinarily the largest, the black, the corrugated, and the southern green. They may be taken at any time of the year except the spawning season, from January 14 to March 16, during which time they are legally protected. In California it is necessary to have a game fishing license to hunt abalones.

To prepare the abalone for the table the white meat is first cut into thin steaks and pounded with a wooden hammer to soften the muscular tissue. The steaks are then dipped in batter and fried quickly in hot fat after the manner of the abalone's smaller cousin, the oyster.

How to Improve Your Trolling

[*Continued from page* 78]

rod is ideal for all trolling purposes, likewise for the casting of heavy bucktail spoons and plugs, as in muskellunge fishing.

The regulation bait casting reel in the 100-yard size will do for most trolling. By carrying 50 yards of line, which is 150 feet, you will be able to get out 75 to 85 feet of line with ease and still have plenty to spare. For deep trolling for the lake trout one needs a 200 to 250-yard reel, since one often has to go down to a depth of 175 to 200 feet.

Many fishermen lose their best fish by reason of the half-hearted jerk that they give the line in setting the hook. The more line that is out, the more ambitious must be the setting of the hook in that the resistance set up by the water on the line, eats up the energy travelling along its length. Give two or three powerful jerks and thereafter keep the line taut. Dull hook points on the trolling spoon is another reason for failing to hook a fish properly. Carry a small three-cornered file in the tackle box and occasionally "dress" down the points.

Seeking Poison Fangs of Snakes

[*Continued from page* 127]

I have heard of one stunt permitting an owner to become familiar with his serpents, and have seen some proof of it. It is this:

The native who has a fresh-caught bunch of serpents to tame for handling, rubs an old cotton shirt on his perspiring body, until the shirt reeks of his perspiration. Then he throws the shirt into a sack with the snakes. After some hours have passed, he sticks in his hand without fear, brings the reptiles out and handles them freely without exciting them. The snakes have made his acquaintance through odor, have slept on the cloth bearing the odor of the man, and found it brought no harm.

Cobras Do Not Dance to Music

The famous cobra dance to music is a fake. I have demonstrated this in my own home with a cobra. Although certain sound vibrations do attract serpents, the weaving, dancing motion of the snake is really the reptile's nervous following movements of the musician's body.

Snake's ears are crude affairs, deep sunken, and my own experiments have convinced me that the sound vibrations of wind or stringed instruments that will attract serpents are pitches so high on the scale that the snakes do not hear the sound at all. Instead, they feel the sound vibrations on the surface of their sensitive scales.

How Snakes Are Milked

The process by which venom is extracted from reptiles is quite simple. A small glass jar is covered over the top with gauze. The snake is grasped just back of the head between thumb and first finger, held forward and allowed to bite the gauze. His fangs penetrate through and venom flows. Then pressure is applied with thumb and finger upon his venom glands, draining them.

This process can be repeated every ten days or so without noticeable harm to the snake, beyond a ruffling of the temper.

My good friend, Clyde Beatty, famous animal trainer, once called on me at the reptile house just after I had completed the job of milking a big batch of cobras. He told me about some of the stunts he was planning with lions and tigers, and made my hair almost stand on end. "You can have your job, Clyde," I said.

Then, when I showed him a squirming bunch of cobras, still angry from having their venom removed, and told him how it was extracted, the intrepid lion tamer turned to me solemnly.

"Doctor," he said. "I'll return the compliment. You can have *your* job."

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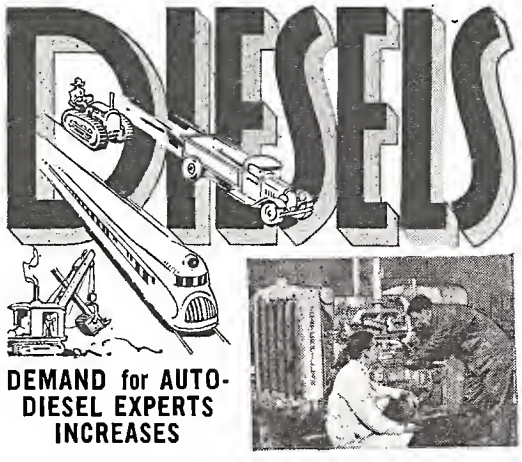

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Rescues of the Lighthouse Keepers

[*Continued from page 72*]

known guardians of the sea's traffic, singly or in combinations of three, depending upon a ship's location, can determine her position through the magic of radio and sound.

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Lights Have Own Flashes

Each lighthouse has characteristic flashes and ship captains identify each light by timing its flashes. Even the fog horns may be recognized by the spaces between their deep-throated booms. One, for instance, sends out two short blasts two seconds apart every half-minute.

Nothing is permitted to silence the fog horn or extinguish the light. Every night the keeper winds a clock mechanism which turns the light on its base of quicksilver, but sometimes a cog slips, a wheel breaks. The turning mechanism went out of commission at Ano Nuevo light, near Pescadero, recently. Joe Berg, the attendant, stood guard through the night, turning the giant light one revolution every two minutes that its tell-tale flashes from the 500-watt bulb might be easily and correctly identified.

On another occasion the fog bell refused to function at the Angel island light in San Francisco bay, and for 28 hours the keeper struck the big gong steadily by hand.

Ships Crash Below Keepers

In spite of all precautions ships occasionally crash at their very feet, ship-wrecked people are washed ashore almost into their arms—

For instance, there was the time when a boat loaded with fish crashed at the base of the cliffs, at the top of which—610 feet, almost straight up—stands the Pt. Reyes light, 60 miles north of San Francisco.

The three half-drowned and half-frozen fishermen could not climb the precipitous cliffs. For 13 hours after the sea had cast the unfortunate seafarers ashore an 80-mile gale and the yapping of thousands of sea lions smothered their cries for help. At last they were heard and Fred Kreth, muscular keeper at Pt. Reyes, slid and tumbled to a narrow ledge 300 feet above the pounding surf, and from his precarious perch pulled the men to safety by the aid of long ropes.

[*Continued on page 141*]

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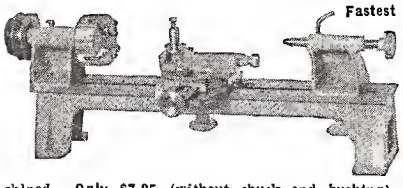

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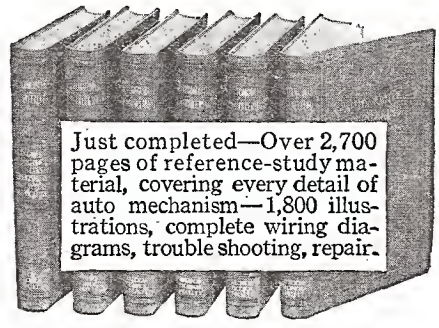
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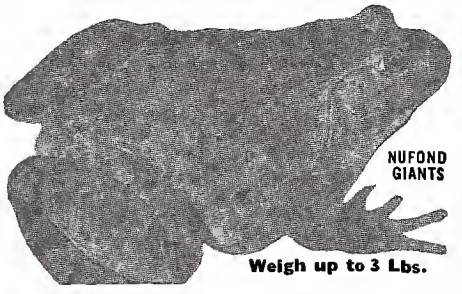

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Chandu Reveals His Magic Secrets

[*Continued from page* 122]

placed them?) and a collapsible cage, carefully folded about the live bird, drops down to the bottom of the cabinet. It is half open when it drops, due to concealed springs, and springs into full size as it is drawn out of the cabinet.

Try These Magic Tricks

Here are a few tricks you can perform at home with easily-obtained apparatus:

The Spirit Cane: An ordinary cane is brought forth and stood between a person's legs. A few mystic passes over it, and the stick begins a weird dance, seemingly in thin air. Cut a piece of fine black silk thread, and attach bent pins to each end. The lights are dimmed, and at the first opportunity the pins are fastened to each knee. The cane is requested, and, as you make passes over it, grasp the invisible thread and make a loop over the cane. Spread your legs, and the cane will hop and dance.

The Tell-Tale Mirror: Gather a group of friends about and tell them that you have a magic mirror which will answer questions about their future. Get a piece of French chalk at the drug or art store and write, on each end of a wall mirror, the words *yes* and *no*. Now take a piece of silk and wipe the mirror clean. This operation, of course, is done secretly. Next, you ask a person to breathe on the mirror. If they breathe on the top, it will be "yes"—on the bottom, "no."

Picking One Particular Paper From A Hat: Tell your friends you can pick out anyone's name—or your own—from a hat. Each person writes his name on a piece of paper, then you are blind-folded. Pretending to be a medium with supernatural powers, you take the paper you wish to pick out later, roll it up just as the others have done, and toss it carelessly into the hat with the other name slips. After shaking the hat, you reach in and pull out the correct paper. How? You've rolled a pea or bean up in the paper.

Read Sealed Messages

Spirit Reading: For this last trick you'll need a small sponge, a long rubber band and a bottle of acetone. Fasten one end of the rubber band above your elbow, then put on a coat or jacket with full sleeves. Pull the rubber band down and tie it about the sponge.

In a side pocket, uncork the bottle of acetone and moisten the sponge. Tell your friends to write a few words on pieces of paper and place in separate envelopes.

Wave an envelope about to attract attention to it. Now—make a few passes over the envelope with your right hand, wetting it with the sponge soaked in acetone. Raise it quickly upward. You will notice that your side of the envelope is almost transparent, allowing you to read the message clearly at a glance.

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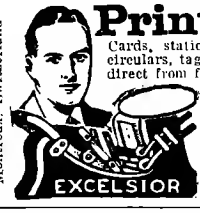

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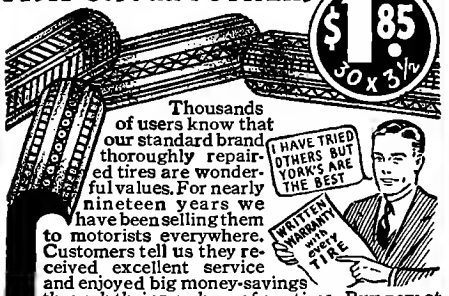

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29x450—20	2.35	.85	550—17	3.35	1.15
30x450—21	2.40	.85	28x550—18	3.35	1.15
28x475—19	2.45	.95	29x550—19	3.35	1.15
29x475—20	2.50	.95	600—16	3.75	1.45
29x500—19	2.85	1.05	600—17	3.40	1.15
30x500—20	2.85	1.05	30x600—18	3.40	1.15
525—17	2.90	1.15	31x600—19	3.40	1.15
28x525—18	2.90	1.15	32x600—20	3.45	1.25
29x525—19	2.95	1.15	33x600—21	3.65	1.25
30x525—20	2.95	1.15	32x650—20	3.75	1.35

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Size	Tires	Tubes	Size	Tires	Tubes
30x3½	$1.85	$ .75	33x4½	$3.45	$1.15
31x4	2.95	.85	34x4½	3.45	1.15
32x4	2.95	.85	30x5	3.65	1.35
33x4	2.95	.85	33x5	3.75	1.45
34x4	3.25	.85	35x5	3.95	1.55
32x4½	3.35	1.15			

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(High Pressure)

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30x5	$4.25	$1.95	34x7	$10.95	$3.95
33x5	3.75	1.45	38x7	10.95	3.95
34x5	4.25	2.00	36x8	12.45	4.25
32x6	7.95	2.75	40x8	15.95	4.95
36x6	9.95	3.95			

TRUCK BALLOON TIRES

Size	Tires	Tubes	Size	Tires	Tubes
600—20	$3.75	$1.65	825—20	$8.95	$4.95
650—20	4.45	1.95	825—22	9.95	4.45
700—20	5.95	2.95	900—20	10.95	5.65
750—20	6.95	3.75	975—20	13.95	6.45

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Man Will Migrate to Mars

[*Continued from page* 64]

The end of tuberculosis, diabetes, septicemia, and a host of similar afflictions by a fuller knowledge of the chemical factors involved and so on.

What greater hope may be held out to suffering humanity than such predictions as these, and yet they are nothing more than extrapolations of well-recognizable trends.

The control of the age cycle will become an accomplished fact by introducing certain new organic compounds into the human system. Thus an individual would be able to order an indefinitely long life (except for accident) at any given age level he or she may choose, such as thirty to thirty-five or eighteen to twenty-two. If this prediction is extended to the year 3035, I shall include the statement that by that time, Methuselah's record will have fallen.

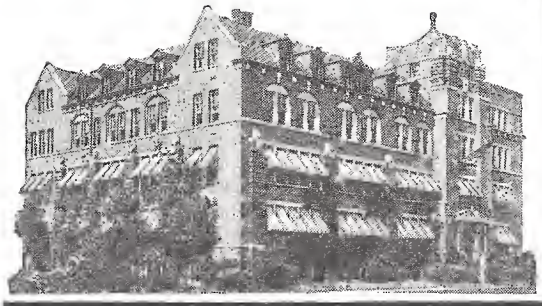
Wars Will Bring New Weapons

As to war, the effectiveness of high explosives has been greatly reduced by the chemically made smoke screen, and toxic gases are rendered harmless by a canister of active charcoal. And thus may we expect the trend to continue.

Should the next century see the extension of the principal of humane offensive weapons (which already has been introduced by the use of tear gas) to include contact anesthetics or temporary paralysis-producing compounds, just as certainly will a defensive antidote be developed. Or should some arch-fiend succeed in producing an offensive device of such potency that entire populations may be eradicated, thereby fulfilling the dream of many pacifists that war will become too horrible for any nation to wage it, just as certainly will some genius arise and discover a means to render this device innocuous. Such considerations lead to the conclusions that, irrespective of what chemistry may contribute to warfare during the next century, the determination of victory will remain where it has always been—in the hands of the men with the knives.

Knowledge Will Be Concentrated

Sometime within the next century, the revolution which is now going on in physics will come to an end. This will be characterized by a majority of physicists agreeing upon the nature of the physical universe and remaining in agreement for a reasonable period of time. Following this very desirable event, a man or group of men will appear in chemistry who will recodify its laws in much the same manner as was done by Mendeleef and Willard Gibbs. This will make it simple and easy for the student to cover much more ground in a given time than is now possible.



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- ☐ Electrical Engineer
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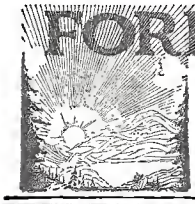

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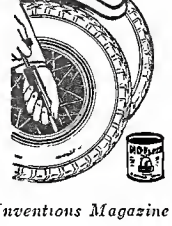

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AMBITIOUS Young Men interested in entering Aviation as Apprentices see page 142.

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Study Butterflies In Microscope

[*Continued from page* 59]

slide, with the same technique as before.

When these two slides are ready for study, observe the scaleless one first. The wing surface is seen to consist of a thin membrane, well supplied with fine hairs. During development, this structure grows out as a flap or extension of the body wall, in the form of a wing pad. It is not, therefore, anything like a vertebrate arm. After the pupa transforms into the adult, the wing pads expand and dry out.

The veins carry oxygen to the growing wing pads, but in the adult these veins serve only to stiffen the wings.

And what is the role of the scales? Turn to the other slide and observe by both transmitted and reflected light. Some scales have their color in the form of deposits of pigment (chemical coloration). In others the color is not present at all, but results from the breaking up of light rays (physical coloration) so that some are absorbed while others are reflected, our eyes seeing only the latter. In such cases the scales appear black or dark gray by transmitted light, no matter how brilliant the hue by reflected light.

Steps In Good Horsemanship

[*Continued from page* 33]

and the front ones have not yet been extended forward.

The extended gallop (a canter is a restrained gallop) is more often called the rim. This is a four beat gait, in which the horse is moving at the maximum speed he possesses. The take off and movement is similar to the canter, so far as the order in which the legs move is concerned, but each of the four feet strike separately giving a four beat gait.

The pace is a 2 beat gait, but the movement is lateral, as the front and hind legs on one side take off and strike together—then those on the opposite side move forward in the same way.

Gaited saddle horses possess two additional gaits. These are the rack and the slow gait. The rack, usually called singlefoot, is a flashy gait in which the horse carries the head high, legs well collected, and moves with great dash and animation. It is a four beat gait, very easy on the rider, but hard on the horse.

The trotting gait at any speed is the most tiresome for the rider, due to the animal's diagonal bipede motion. But in any event, it is necessary for the rider to know his mount, and the gaits of which his mount is capable, for in this manner alone can he obtain the maximum of enjoyment which comes with good horsemanship.

Rescues of the Lighthouse Keepers

[*Continued from page* 130]

At times the wind blows at Pt. Reyes so violently no man can walk out of doors. One recent stormy night the gale blew the anemometer out of its socket at 128 miles an hour.

When storm signals fly, the lighthouse crews remain in their round towers, marooned as effectively as though lost on some desert isle. Towers rock and groan, threaten to sail away before the terrific blasts of wind.

For a week the crew at Los Angeles were marooned during a winter storm. Though there was fuel 30 feet distant in a storage hut, the cook could not cross those 15 paces and after the third day prepared meals with a gasoline blow torch. Waves broke over the storage house and smashed in windows 30 feet above the level of the sea.

Again, for 10 days the crew could not leave the tower; when finally they emerged, a plumb line revealed the tower, built of steel and concrete and weighing thousands of tons, had been tilted out of vertical — a leaning lighthouse Tower of Pisa.

Rocks Dashed Into Tower

On one occasion at Tillamook Rock, 183 feet above the sea, a sudden storm washed a thousand-pound rock up the cliff and into the light, while the fog horns became so filled with small rock that not even superhuman efforts could make them blow. So fiercely did the high winds shove walls of water ahead and up the mountain that the crew was forced to open the lower waterproof bulkheads that the tower might drain.

Some of the lights can be reached only from the sea in open-air elevators, known as skips. St. George's Reef, 14 miles offshore near the California-Oregon line is such a place. Built at a cost of $750,000, this is the world's most costly lighthouse.

Sea is Rough Night and Day

There the sea is rough day and night. The lighthouse was built in the sea by supply ships, dropping a rock at a time into the waves. For seven years storms and heavy seas were so frequent crews could work only 70 days a year. Finally, the deck was completed. This consists of interlocking granite slabs, weighing from four to 17 tons each. To remove them one would have to begin at the middle, working out and down.

Even before this lonely outpost was completed, a vicious storm forced the tender to drag its anchor 80 miles, almost to Eureka, Cal., before it abated. Crews board the lighthouse in their boats which are lifted 50 feet to keep them out of reach of the sea.

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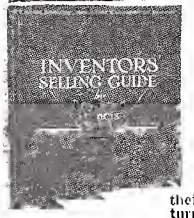

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Needed Business Office Inventions

[*Continued from page* 81]

quick operation. In short, we need a twentieth century pen wiper that will sell for twenty-five cents. It would save desk tops and prolong the life of pen points.

Today, letter openers used in our large offices open only one letter at a time. What is needed is a letter opener that will open a whole bundle of letters at a single stroke. It can cost as high as fifty dollars.

The small business man cannot afford to use hand or power operated envelope sealers of the approved type even though they are available. There is needed a hand device operated on the principle of a moist roller that will be used to run over the envelope flap.

Stenographers spend a great deal of time keeping the type on their machines clean. We need a little attachment which will reduce this cleaning time.

Brokerage offices always send stock certificates by first class mail to their customers. Envelopes used for this purpose are always sealed with sealing wax. This is a hand operation and requires a great deal of time. A small electric sealer is needed. The wax used should be placed in a small electrically-heated pot and the die should also be heated.

Hazards of Dynamite Plants

[*Continued from page* 29]

which covers the floor. Due to this great danger every man is a self constituted safety inspector.

The penalty for carrying one safety match within the plant is a ten-day lay off without pay, and if the match is a strike-anywhere type the penalty is summary dismissal. Shoes are made without nails, metal eyelets, or metal lace tips. Floors are of sparkless lead or battleship linoleum. Shovels are made of wood, pliers and other metal tools of monel metal or some other non-sparking material.

Nitroglycerin is carried from storage tank to mixing house in a small copper tank mounted on a springy, rubber tired carriage. Workmen push these carriages over concrete runways which are kept free of the least bit of roughness or irregularity. The "dope," which may be sawdust, woodpulp, nitrate of soda, or one of a number of other fillers, absorbs the liquid nitroglycerin which imparts to the compound its firing characteristic.

To make stick dynamite, the explosive compound is carted from mixing house to packing building in small wheelbarrows. The loose powder is then thrown with wooden scoops onto a conveyor belt which takes it to the packing machine. The familiar paper casings receive the powder, are sealed and conveyed by mule drawn tramcar to another building to be coated with molten paraffin.

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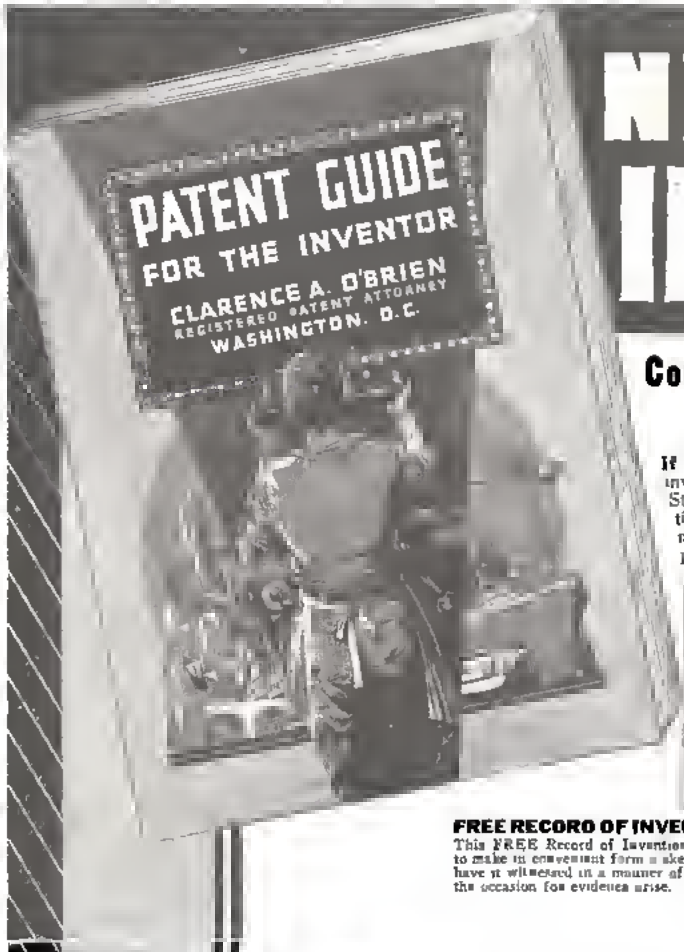

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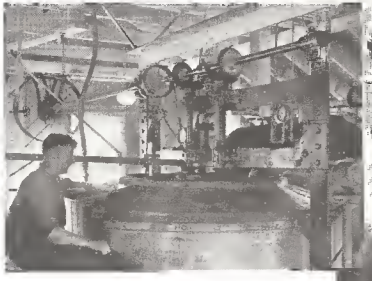
Hazards of DYNAMITE PLANTS

A story of the dynamite makers—brave men who mix "soup" and "dope" behind "DANGER—HIGH EXPLOSIVES" signs.

by WALTER E. STEWART



In this tank acids combine with glycerin to form nitroglycerin. The operator must watch the liquid constantly, ready to open a valve and admit water at signs of danger, or to operate a lever which dumps entire tankful into a huge cistern of water.

The roof of this isolated dynamite packing house can just be seen over the top of the heavy timber barricade used to divert the force of explosion upward.

Drawing shows the rubber-tired carriage used to transport tanks of nitroglycerin from storage vat to the mixing house. Dynamite house doors always swing outward for instant exit.

DESPITE the fact that makers of dynamite observe more safety precautions than do men in any other industry, dynamite making is still one of the world's dangerous enterprises. Carelessness, haste, or negligence bring sudden, shattering death, as concentrated explosives release pent-up energies, toss buildings and machinery skyward.

On June thirteenth of this year, some explosives maker in the little town of Reinsdorf, Germany, erred. A series of shattering explosions at the Westfalian Anhalt Explosive Works rained blackened debris over the countryside, destroying the town, killing and injuring thousands of workers.

The isolation of dynamite plants from big cities is a subtle warning of the death that lurks in every sizzling chemical vat.

One comes upon a tall wire fence, surmounted by several strands of barbed wire. A glaring sign on the large gate is enough to turn back the casual visitor. It reads, in expressive red letters, "DANGER, HIGH EXPLOSIVES." Inside the fence is a no-man's-land of wooded terrain, well cleared of inflammable underbrush. Upon passing this one comes upon, apparently, a series of well-separated fortifications of the rectangular block house type. Some of these have for walls earth embankments twelve feet thick at the base, three feet wide at the top, and towering to the height of a two-story building. Others, apparently of more recent design, have heavy concrete retaining walls with earth in between, or log cribworks filled with earth.

In a huge tank in one of these houses is stored several thousand pounds of that most powerful explosive, nitroglycerin. This single tank contains enough deadly power to blast 96,000,000 pounds of solid rock from quarry or mountainside.

In two other embanked buildings are large, frictionless mixing machines which compound the nitroglycerin or "soup" with "dope" to make dynamite or one of the many types of explosive powder. Other buildings are steam heated drying houses, storage bins, packaging houses, and shipping rooms.

Each operation is conducted in a separate building, and usually no more than three men are permitted to work together in one of them. The buildings are lightly constructed so that they will easily give way to an explosion. The heavy outer bulwarks then divert the force upward, preventing an explosion in one house from spreading to others.

Friction is the most deadly foe of explosive workers. A tiny bit of sand or metal in a mixer means almost certain death for the two workers and destruction for the expensive machinery and buildings. The result may be the same if a man carelessly slides one drying pan over another, or if in moving about he drags his feet over the dry powder

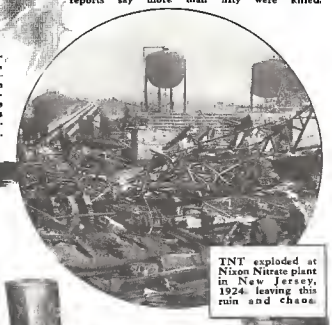
[*Continued on page* 142]

OTHER MUNITIONS EXPLOSIONS

1934—150 killed in dynamite explosion which destroyed the greater part of La Libertad, El Salvador.
1933—Several killed, many seriously injured in explosions in bomb storehouses and powder magazines at Hamamatsu airbase in Japan.
1931—Forty-five killed by blast in torpedo loading plant at Rio de Janeiro, Brazil.
1926—Many killed in explosion of naval arsenal at Lake Oenmark, New Jersey.
1924—Nearly thirty killed when TNT exploded at Nixon Nitrate plant, N. J.
1918—Twelve killed in explosion at E. I. du Pont de Nemours powder works, Pompton Lakes, N. J.
1918—One hundred killed at TNT plant, Aetna Chemical Co., near Pittsburgh, Pa.
1917—Two killed by blast at Haskel, N. J., powder works of du Pont.
1916—Four killed at Black Tom powder plant, N. J.

Here, in a partially demolished house near the German munition plant at Reinsdorf, men are searching for the bodies of blast victims. Official reports say more than fifty were killed.

The Reinsdorf munitions blast, termed "the greatest catastrophe in the history of central Germany," is pictured here as sketched by an artist. Fire followed.



TNT exploded at Nixon Nitrate plant in New Jersey, 1924, leaving this ruin and chaos.

This new explosive, known as Nitramon, is immune to flames, and can be detonated only by a large charge of dynamite. Large supplies of Nitramon can be stored in safety, where ordinary stick dynamite or TNT would prove too hazardous.

In no sport is perfect cooperation between man and horse more essential than in polo. In this photo, Spencer Tracy, movie star, times his shot by the stride of his polo pony.

Steps That Count in GOOD HORSEMANSHIP

by
WAYNE DINSMORE
Secretary,
Horse and Mule Association of America

Horse shows at the fairs this fall will be appreciated more than ever when one understands what is taking place in the arena. In this article, one of America's foremost authorities on riding horses gives inside facts on good horsemanship.

THE beauty and daring of good horsemanship belong to the ages. Figuratively, the man in the saddle is a superman. In no other sport do we find a more variable technique than that required of the skilled horseman; from the rough-riding bronco buster to the rider of sleek show and saddle horses.

In short, it is a sport that makes a premium of perfect co-ordination of mind and muscle, grace and poise and a psychological knowledge of the horse.

Almost everyone has either attended a horse show to marvel at the sheer beauty of the saddle horse or has stood in amazement as some fine horse would pass on the bridle path. But few know that technique of riding well and the distinction between the gaits of horses.

Three gaits come naturally to every horse—namely, the walk, trot and canter. But to this trio must be added the rack, commonly called the single-foot, to complete the list of basic gaits. There are other gaits, but in every case they are variations of one or the other of the basic gaits.

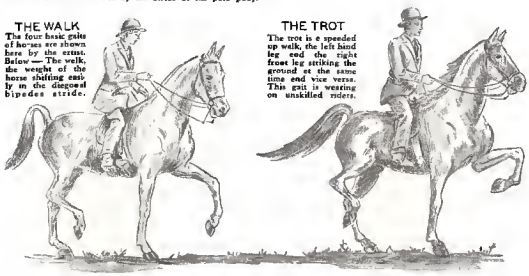
The walk is a 4 beat gait, as each foot strikes the ground separately. It is diagonal in nature. The right front strikes the ground, then the left hind, then the left front, then the right hind, after which the series starts over. There are always two points of support resting on the ground.

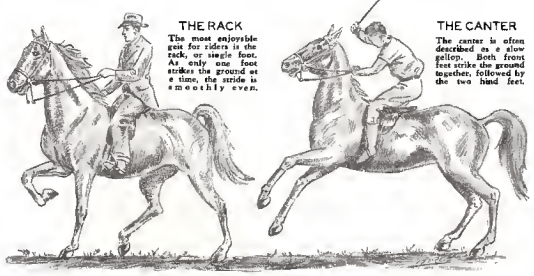
The trot is a 2 beat diagonal gait, in which the right fore and left hind take off, and strike simultaneously. The opposite diagonals take off as the first set are striking the ground, although in the fast trot there is an interval when all four feet are off the ground.

The canter is a 3 beat gait of diagonal nature, as in one lead the right front and left hind strike at the same instant, whereas the left front and right hind take off and strike, not simultaneously but at different intervals. There is a perceptible period in which all legs are off the ground, folded beneath the body, as the hind legs are being carried forward,

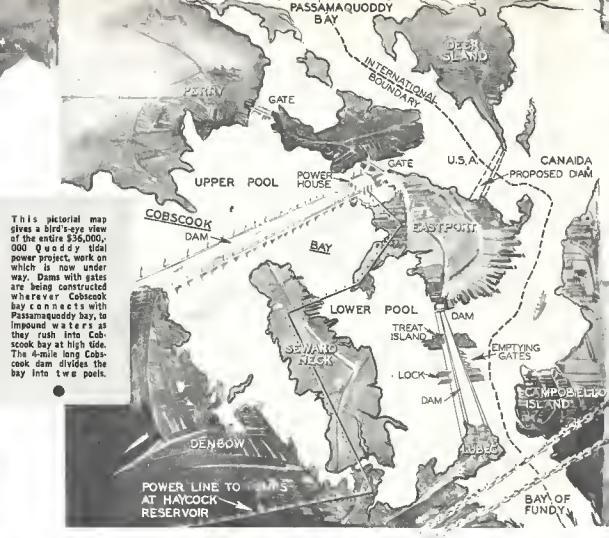
[*Continued on page* 140]

A thorough knowledge of the gaits of horses is necessary before jumps can be made gracefully. In this photo, Mrs. Robert Guggenheim, Long Island, takes her mount over the hurdles with perfect form.

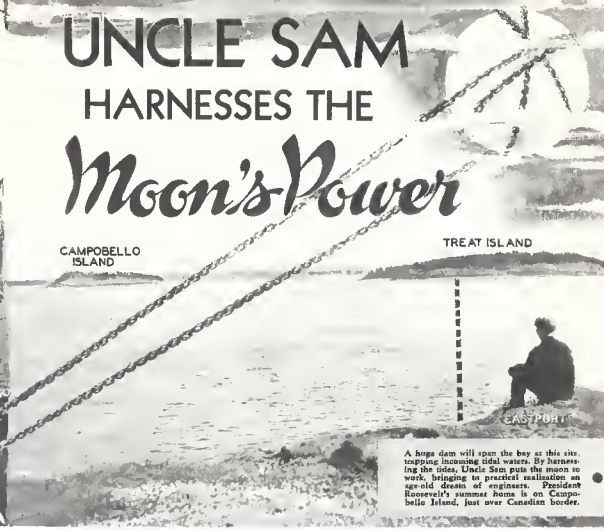

THE WALK
The four basic gaits of horses are shown here by the artist. Below — The walk, the weight of the horse shifting easily in the diagonal bipedes stride.
THE TROT
The trot is a speeded up walk, the left hind leg and the right front leg striking the ground at the same time and vice versa. This gait is wearing on unskilled riders.


THE RACK
The most enjoyable gait for riders is the rack, or single foot. As only one foot strikes the ground at a time, the stride is smoothly even.
THE CANTER
The canter is often described as a slow gallop. Both front feet strike the ground together, followed by the two hind feet.

UNCLE SAM HARNESSES THE *Moon's Power*

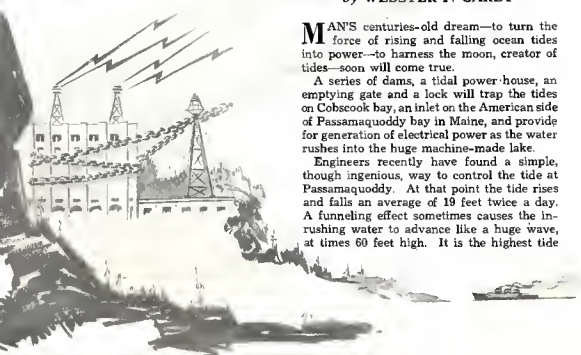


This pictorial map gives a bird's-eye view of the entire $36,000,000 Quoddy tidal power project, work on which is now under way. Dams with gates are being constructed wherever Cobscook bay connects with Passamaquoddy bay, to impound waters as they rush into Cobscook bay at high tide. The 4-mile long Cobscook dam divides the bay into two pools.



A huge dam will span the bay at this site, trapping incoming tidal waters. By harnessing the tides, Uncle Sam puts the moon to work, bringing to practical realization an age-old dream of engineers. President Roosevelt's summer home is on Campobello Island, just over Canadian border.

by **WEBSTER F. CAREY**



MAN'S centuries-old dream—to turn the force of rising and falling ocean tides into power—to harness the moon, creator of tides—soon will come true.

A series of dams, a tidal power house, an emptying gate and a lock will trap the tides on Cobscook bay, an inlet on the American side of Passamaquoddy bay in Maine, and provide for generation of electrical power as the water rushes into the huge machine-made lake.

Engineers recently have found a simple, though ingenious, way to control the tide at Passamaquoddy. At that point the tide rises and falls an average of 19 feet twice a day. A funneling effect sometimes causes the in-rushing water to advance like a huge wave, at times 60 feet high. It is the highest tide near civilization which provides usable power.

"Tide traps" now being designed by army engineers for the $47,000,000 project come as near to harnessing perpetual motion and supplying perpetual power as any method yet devised.

A series of five dams, the largest four-fifths of a mile long, will cut off Cobscook bay from the Bay of Fundy, which is open to the sea. When completed, the water level in the bay will be maintained at the level of low tide. When the tide rises five feet, twice each day, the sea will be turned into the bay through a series of turbines.

Fourteen hours daily the turbines will whir, as the tides rise from the five-foot mark to high, then flow out again. During each period the thirty-seven square mile lake will rise two and one-half feet. To empty it during each 90 minutes of low tide, the engineers will make use of 25 Venturi-type gates, each 30 feet tall and 30 feet wide at the narrowest point. When the water levels inside the lake and in the outer bay become equalized, the gates will be closed, and when the outer water rises five feet, generators will hum again.

Although the "tide traps" will be closed down for two five-hour periods each day, the great project will furnish continuous power. Fifteen miles south of Cobscook bay the army plans to create an 8,000-acre storage reservoir. Levees will rise from 10 to 30 feet around the big basin to hold back the water.

As the tides rise and fall, surplus power will be transmitted over a high tension line to the reservoir to pump water from the sea 135 feet up into the new lake. During shut-down periods at the main tidal plant, this stored water will be used to generate power at the nearby Haycock power plant.

Funds provided by the Emergency Relief Appropriation of 1935 will make possible production of enough power to supply all industrial and domestic needs within a radius of

Lindy's Invention Perfects the Mechanical Man

by RAYMOND L. BOWER

Lindbergh's new "mechanical heart" calls attention to the fact that medical science even now has marvelous machines which will replace parts of the human body or do the work of parts that fail.

MEDICAL science has machines that will breathe for you, talk for you, hear for you, eat for you, circulate your blood—and even sweat for you—if you should ever happen to need them. Colonel Charles A. Lindbergh, a mechanical genius as well as a great aviator, has recently constructed a "mechanical heart" by means of which vital organs can be kept alive outside the body for months and probably years. So far, of course, only animals have been used in the experiments with the mechanical heart conducted at the Rockefeller Institute by the famous medical research man and Nobel prize winner, Alexis Carrel.

To Lindbergh goes the credit for another piece of scientific apparatus, a blood testing device which operates on the same principle that keeps a ball suspended in midair by the force below a spray of water.

This new invention separates the red corpuscles of the blood from the liquid part of the blood, not by centrifugal force as in old equipment, but by a washing process which delivers the corpuscles without distorting their shape.

But Lindbergh's work in mechanics, coupled with Carrel's work on living tissues, recalls attention to the fact that there is almost no part of the human body that cannot be replaced or supplemented by some machine or drug.

Normally, the body strives to retain its natural functions. That is why there are two of most (not all) important organs. If one kidney is removed, for example, the remaining kidney will increase in size and do the missing kidney's work.

Unfortunately, there is only one heart. When that stops, the body stops. Everyone knows that the heart is nothing more than a delicately-balanced, though very strong and enduring, pump. At regularly-timed intervals it spurts the blood into the main arteries and from there along the lesser arteries until it finally goes through the thousands of miles of capillaries (very tiny blood vessels) which reach every last little cell in the body.

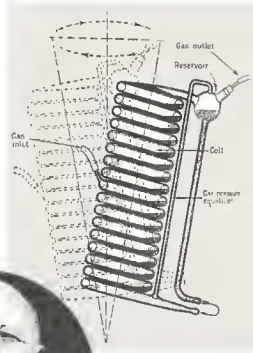
What Lindbergh has done is to build a pump of glass and metal which will go on for days shooting streams of blood (or any other fluid) into an organ, such as the liver, which has been removed from the body. By means of a thin tube, the mouth of the pump is attached to the main blood vessel of the removed organ, which remains in a glass jar filled with infection-resisting fluid. Every time the pump tilts, a stream of feeding solution (not blood) passes along the tube and so into the artery and the capillaries. The removed organ will live as long as it has food and remains free from infection.

At present, the mechanical heart is being used for experimental purposes only. With it doctors will be able to find out exactly how vital organs of the body do their work. This is more accurate than the research methods now applied directly to human beings.

Doctors to-day have several machines that will breathe for you. The pulmotor, applied over the face, forces air directly into the lungs. The Drinker respirator, a cabinet within which are created alternating air pressures, takes the place of the muscles which operate the lungs, just as the pressure of the hands on the ribs is employed in the Schafer method of artificial respiration. The oxygen tent or oxygen-tube, fitted through the nose, delivers concentrated volumes of this life-giving gas to the choking patient.

There is another machine, worked by electricity, which will set a heart beating again after it has been stopped for a few minutes—by some sort of shock, electrical, operative,

Col. Charles A. Lindbergh, in collaboration with Dr. Alexis Carrel, below, studied the medical world with the announcement of an artificial heart which can revive and sustain life in organs which have been removed from animals. Lindbergh spent five years in secret biological research at Rockefeller Institute, New York.

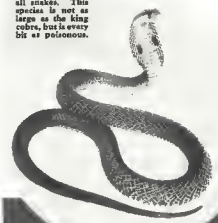


This diagram shows the first form of the mechanical heart, invented by Lindbergh four years ago. The present device is similar in principle. The coil of glass, rocked in and fro, pumps feeding solutions through living organs. A lung effect is obtained by admitting oxygen through the tube show at the left center.

Deaf and dumb children hear the songs of a radio stee through tiny devices which, pressed against the bone near the ear, creats mechanical vibrations which can be heard. At left are two forms of the artificial larynx—one which requires insertion of a silver pipe in the throat (here a hand-operated bellows is supplying the air), and latest model producing a pure tone electrically.

SEEKING *Poison* of DEADLY *Fangs* SNAKES

No friend of man is this deadly water moccasin, shown in a defensive attitude. It inhabits swamps and rivers in the South. Below—The spectacle cobra, one of the most deadly of all snakes. This species is not as large as the king cobra, but is every bit as poisonous.



An Interview with

DR. RAYMOND L. DITMARS

by

RALPH DAIGH

From the lethal fangs of poisonous snakes, Dr. Ditmars, Curator of Mammals and Reptiles at the New York Zoological Park, is extracting a fluid which is aiding science in the fight against disease. Read of his experiences in this interview.

HAVE I handled more poisonous snakes than any other man?

Well, I won't fight for that distinction, yet I believe it is mine. In almost forty years of experimenting with deadly reptiles, I have literally captured several tons of them personally, and have purchased thousands of snakes from natives and dealers.

My search for poisonous snakes has carried me throughout our own country and the tropics. Yet, my most extraordinary and thrilling snake hunting adventure occurred in downtown New York.

"Two king cobras are loose in my store," a frantic animal importer told me over the telephone. He implored me to capture the reptiles.

King cobras!

Largest and most active of poisonous serpents. With the single exception of the mamba, the cobra is the only deadly reptile that will deliberately stalk and attack humans unprovoked. Indo-Malayan in habitat, the king cobra is fifteen feet of lethal hazard.

Two of these reptiles, should they escape to the streets, might throw New York City into a panic.

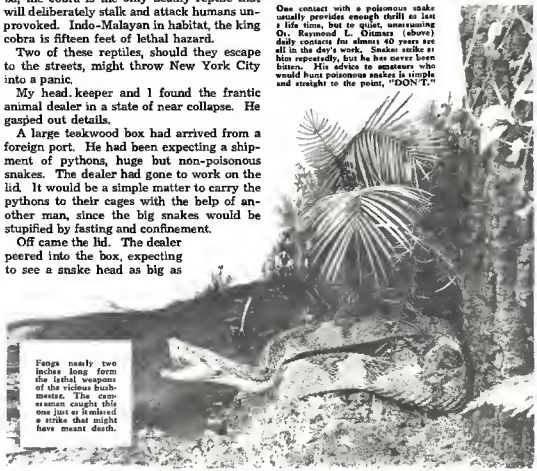
My head keeper and I found the frantic animal dealer in a state of near collapse. He gasped out details.

A large teakwood box had arrived from a foreign port. He had been expecting a shipment of pythons, huge but non-poisonous snakes. The dealer had gone to work on the lid. It would be a simple matter to carry the pythons to their cages with the help of another man, since the big snakes would be stupified by fasting and confinement.

Off came the lid. The dealer peered into the box, expecting to see a snake head as big as

Dr. Ditmars is shown "milking" a water moccasin. When the fangs penetrate the gauze, venom is spurted into the glass. Note bit grip on serpent's head, just below the poison sacs.

One contact with a poisonous snake usually provides enough thrill to last a life time, but to quiet, unassuming Dr. Raymond L. Ditmars (above) daily contacts for almost 40 years are all in the day's work. Snakes strike at him repeatedly, but he has never been bitten. His advice to amateurs who would hunt poisonous snakes is simple and straight to the point, "DON'T."



Fangs nearly two inches long form the lethal weapons of the vicious bushmaster. The specimen caught this one just as it missed a strike that might have meant death.

"CHANDU" REVEALS HIS *Magic Secrets*

by

HAROLD L. ZIMMER

Will L. Lindhorst, the original *Chandu*, tells you how to perform feats of magic which have amazed many millions.

THE original charter of the Society of American Magicians on Nov. 5, 1921 gave to Will L. Lindhorst the title of *Chandu*—a name which today has been made famous by his feats of magic on the stage and by radio broadcasts which have thrilled countless millions.

In this article, I will endeavor to acquaint you with several really worthwhile tricks as *Chandu* explained them to me. Whether or not you wish to become a magician, the tricks presented here will at least afford many happy hours of fun at home or at parties.

One of the oldest yet most baffling of magic tricks is the "Sack Escape." A heavy canvas sack, genuine in every detail is brought forth. Large enough to contain a man, it is passed through the audience for inspection, everyone agreeing that it is a sack. A solid metal rod, with holes in either end to admit padlocks, is also passed about. A man crawls into the sack, the rod is slipped through rings at the top, and padlocks are snapped into each end. *Chandu* waves his cloth in front for a few seconds, and lo! the man has escaped. The sack remains locked—but empty. Keys? He didn't have any—and even if he had, he couldn't have worked even a finger through to use them.

Take two minutes and try to guess how it was done. Now—here's the answer: In the first place, there are two bars. They both look alike, even upon close inspection, but the solid one is passed around the audience. When the man crawls into the sack, the fake bar is slipped through the rings, and the padlocks snapped into place.

Behind the cloth screen, the imprisoned man reaches for the two locks through the sack. Twisting them in opposite directions separates the bar, as the two halves are threaded to fit together like a nut and bolt. In a second or two, he has stepped out and replaced the bar in its original position in the eyelets. However, even this simple trick depends on the magician's skill in palming the real bar and substituting the other before the eyes of his watchers.

Another trick which has long baffled theater audiences is the gold fish bowl illusion. A

Anyone can escape in a few seconds from this stout sack even though two padlocks secure the eyelets at the top. In the above photo, *Chandu* (left) is assisting Harold L. Zimmer, author of this article, into the sack. *Chandu* then passes a heavy iron rod through the eyelets at the top of the sack, and inserts padlocks into holes in each end of the bar. At right: The secret lies in the substitution of a two-piece rod, threaded skillfully together, which can be separated through folds of the sack.

The cameos catches *Chandu*—Will L. Lindhorst—performing the gold fish bowl trick. In the top photo, *Chandu* waves his magic cloth over the bare table. Just below, he has passed the cloth completely over the table, and is lifting off gold fish bowl. Note that table appears unchanged. Anyone can perform this trick.

Here is how the trick is done. The dummy drape is placed over the bowl, and the lower drape drawn up underneath the table. Lower and upper drapes are exactly alike, making table appear empty. Under the concealment of the cloth being waved slowly over the table, the upper drape is concealed in hand, lower drape released, and the fish bowl lifted off. Many hours of practice before mirror are needed.

MAN WILL *Migrate* *to Mars*

Poultry of the future, through the application of synthetic hormones, will attain enormous size, and hens will lay eggs the size of footballs.

Through the advancement of science, people may live at any desired age indefinitely. Grandfather, father, and son may share their youth together for hundreds of years.

WITHIN the next century many discoveries will be made. Natural laws we believe in today will be contradicted; new ways of living will be necessary.

I am giving here specific examples of what is probable in 2035, one hundred years from today.

The greater strength and lightness of the materials of construction of the future will develop increased speeds and safety of transportation. Like the return of prosperity, the thousand-mile-an-hour airplane is "just around the corner."

Engineering is already waiting for chemistry to give it a fuel capable of releasing more energy per pound than is required to lift that pound out of the earth's gravitational field. Given such a fuel, interplanetary travel will become a possibility. Gasoline, explosives, or other materials which depend on combustion for their release of energy fall short of this requirement —so much so that a really new magnitude of energy storage must be sought. This perhaps may be found in radio-activity.

So far, the inability to control or direct such energy liberation prevents its utilization for the purpose at hand, but within the next century this difficulty should be overcome. It would seem that some form of synthesis of elements (or their equivalent) of the proper active type would be the logical line of attack. Be this as it may, the major premise is that within a century the chemist will offer to the engineer a "fuel" capable of releasing in useful form more energy than will be required to lift itself through the earth's gravitational field. This, in a short while, will result in making interplanetary transportation possible.

I should not care to give the impression that interplanetary transportation will become commonplace immediately. Considerable preparation of environment will be necessary. Mars will need water, Venus a new atmosphere; all of this will mean work for the future chemists and engineers and, after all, why should we not leave something to be accomplished in the century after next?

The distortion of economics which exists at present in agriculture makes it difficult to interpret properly the future of chemistry in this field. I have heard this economic distortion described as a condition wherein we grow more corn to raise more pigs to make more fertilizer to produce more cotton to plow under. Such a condition is so contrary

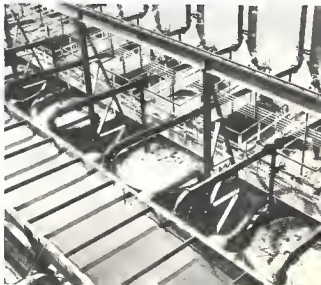
Each wave, crashing through this inlet to the Ethyl-Dow Co. bromine plant, brings hundreds of dollars in unclaimed wealth from the sea. It is estimated that in one year, $50,000,000 in chemicals, including $20,000 in gold passed the gates. Wealth of future will come in this manner.

From the sea water pumped into these vats at the Kure Beach, N. C., bromine plant, bromine used in the making of ethyl gasoline is extracted. Gold, magnesium, potassium, and other valuable metals and chemicals may be extracted from similar vats.

The great strides of science today are but tottering steps compared to future progress says Thomas Midgley, above, vice president of the Ethyl Gasoline Corporation, and holder of the William H. Nichols medal for work in science.

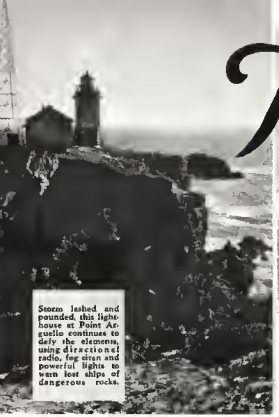
by **THOMAS MIDGLEY**
Vice President, Ethyl Gasoline Corporation

Rocket ships flashing like meteors through the sky, life that defies time, wealth from the sea, animals ten times their present size—these are but a few of the possibilities suggested by Thomas Midgley, in his predictions for the year 2035 based on the scientific developments of today.



Thrilling Rescues OF THE LIGHTHOUSE KEEPERS

by JAMES BOWLES



Storm lashed and pounded, this lighthouse at Point Arguello continues to defy the elements, using directional radio, fog siren and powerful lights to warn lost ships of dangerous rocks.

Piercing both fog and storms, this million candle power light at Los Angeles lighthouse can be seen for miles under the most adverse weather conditions.

The guardians of the coast combine spectacular heroism with modern science to ward vessels from the graveyards of the sea. Their methods and some of their thrilling rescues are told in this article of hardship and courage during storms.

"POINT ARGUELLO — Point Sur—Los Angeles," sang the radio in dots and dashes.

Three operators in these lonely outposts, guardians of ocean traffic along California's rocky and treacherous shore line, huddled before their receiving sets.

"Arguello—Sur—Los Angeles," came the message again. "Where am I?"

As the unnamed ship broke off, the three operators jumped into action.

"Press down your sending key," ordered the Pt. Arguello operator. "We'll find you."

At each station a lighthouse keeper, expert in radio, lights and meteorology, swung his directional antenna until the signal sang strongest in his ears.

Keeper Tom Henderson at Pt. Sur, 300 miles north of Los Angeles, and Keeper I. D. Conklin at the Los Angeles lighthouse, speedily radioed to Keeper George Bosworth at Pt. Arguello, mid-way between, the direction from which the messages had come. Bosworth traced the two lines on a plotting board, added the line from his station. Strangely, all ran inland, and not out to sea.

He examined the map, moved his hand to the sending key.

"Bearings show you are Alongside dock at Richmond, California," sputtered his message to the ship's skipper. "Anything else?"

And with the clearing of the fog, the astonished captain found he had blundered his way to his own dock. The radio bearing had proved uncannily accurate.

Every month some of the three-score light-house crews along the Pacific coast perform miracles of science or physics to save lost ships and distressed crews. Theirs is a little-sung saga of protection for ships plying the Pacific, made more effective recently by the addition to the lighthouses of directional radio apparatus, fog-piercing lights and two-tone fog horns that can be heard beyond the horizon.

The other night a ship crept cautiously toward Los Angeles harbor in an impenetrable fog which had hung over the ocean for three days. Anxious to verify his position before reaching the breakwater, which extends like a finger of rock two miles out into the sea, the captain turned to his radio operator for a comparison of fog-horn signals and radio signals.

He knew the station blew its fog horn and started sending its call letter simultaneously after every silence period. Since radio signals travel with the speed of light—586,000 miles a second—while sound "crawls" at a mere 1,100 feet per second, he started a stop watch when the first radio flash came through and stopped it when he heard the mournful tone of the fog signal. Multiplying the number

Photos by Conklin

A single rock in the Pacific forms the base for the solitary Miles Rock lighthouse. Her friendly beam is a welcome and warning to ships sailing for California's Golden Gate.

This "elevator" for the lighthouse keeper at Anacapa Island, off the coast of California, rises 160 feet from sea level to a loading platform at the edge of the cliff below the tower.

CATCH FISH

by

ROBERT PAGE LINCOLN

Hunting and Fishing Editor

IN LATE summer dry fly fishing is the most practical of all methods. The fisherman who fails to give this method of fishing a real trial has missed out on one of the most fascinating methods devised to fool the speckled beauties of streams and lakes. It is the closest method to "playing natural" of any type of fishing. It is the ideal method of taking all game fish, such as bass, trout, and pan fish, that feed on the surface.

In most cases the novice looks upon dry fly fishing as difficult to master and that only men of peculiar skill can ever hope to accomplish its fine points. Nothing is more untrue. In fact, in some ways, it is easier to master dry fly fishing than wet fly fishing. True, there is need of care in placing the fly, floating it just so, in as natural a manner as possible, but with this taken care of, some of the difficulties that clothe dry fly fishing (in the amateur's imagination at least) are smoothed away.

Dry fly fishing is best suited to quiet streams where the flies can float naturally on the water. Study the types of insects found hovering above or floating on the water and select similar fly. Below are different dry flies.

The horizontal cast, illustrated here, is used when trees and bushes obstruct the overhead cast. Top view shows clock to illustrate method. Nine and three are ends of back cast and 11 and one end of forward cast in this type of stream and lake casting.

The NATURAL WAY With DRY FLIES

Late in the summer when other methods fail dry fly fishing is at its best. The sport is not difficult to master, if you will follow the many helpful tips presented here.

Dry fly fishing is probably the best method to use in the crystal clear waters of mountain lakes. In general at left are three useful knots for fly fishing. For tuile knot slip leader through hook eye, tie knot (A), then slip hook through loop (B), and pull on the leader to tighten

Naturally the first consideration in dry fly fishing is the rod. Here the amateur or beginner meets his first stumbling block. It must be admitted that there are special dry fly rods, ranging in price from forty to seventy-five dollars. Such prices are likely to cause the amateur to quit in despair. The fact is, however, that rods can be picked that will serve both for wet and dry fly fishing as well—that is, by securing a rod that has medium-stiff or moderately-stiff action, since most wet fly rods have a tendency to be too limber or whippy for dry fly fishing. The "all purpose" rod mentioned should be 8½ to 9 feet in length with a weight of 4½ to 5 ounces, depending upon the physical build and strength of arm and wrist of the caster.

A single action reel that will hold at least 80 yards of line can be used, although larger reels, holding 60 or more yards of line are common and are often used. The reel should have a guide set between the plates through which the line is to pass. This is a definite protection to the line. While the automatic reel is suitable for all other manner of fly work, in dry fly fishing the single action reel is generally recommended.

In average wet fly fishing the so-called level line is used The tapered fly line is the recommended line for dry fly fishing. If the reader is unfamiliar with this type of line, let it be mentioned that from a certain caliber in the center this line gradually tapers down to a point. Thus the center of the line, the heavier part, will be size E but will taper down to size H toward both ends. Thus a tapered line will be listed HEH or HDH, or HCH as the case may be. Being tapered in both ends you

[*Continued on page 116*]

MATCH-MAKING— From LOG To LIGHT

In match-making, mechanical fingers have replaced human hands. The first step, shown above, is the debarking of white pine logs which are later fed into splint machine.

Weighing some of the dozen different ingredients used in the manufacture.

Millions of splints fall from the drying kilns into hoppers where the mechanical fingers insert them in revolving drum.

by LIEUT. DON BENN OWENS

FORTY-ODD years ago, more than 1,500 persons, laboring 16 hours a day, were needed to turn out 2,000,000 finished match boxes. Today, with modern match box making machinery, two persons are capable of producing an identical number of match boxes in an eight-hour day.

Similarly, the modern match-making machine, requiring the services of but four workmen, turns out more than 100,000,000 finished matches in a single workday!

More striking, perhaps, is the fact that 3,000 odd persons on the payroll of the match manufacturers in this country, in 1929 earned for their employers more than $19,500,000.

What is the ingenious process in the mass production of matches which permits realizing huge profits in the manufacture of so small an article?

In preparing the "splint" for use in the match-making machine, logs with the bark still attached, eight feet in length and ten inches in diameter, are cross-cut into convenient lengths.

Next, a de-barking machine, consisting of a vertically rotating disc faced with knives, cuts away the outer covering. The log is then slit into thin veneer, one-tenth of an inch in diameter, and fed into the continuous match-making machine.

Impregnation of the match stick is the next operation. Immersed in a boric acid solution, the splint is dried, cleaned and straightened.

An enormous steel plate, resembling a huge water-wheel, has a surface perforated by thousands of tiny holes just large enough to hold a match stick. As this steel plate rotates, almost human fingers pick up the match sticks from the hopper and insert them in the tiny perforations on the cylinder. When all the holes are filled, the cylinder moves forward along the metal table, warming the splints over a heated metal block to absorb paraffin. The cylinder revolves once inside the molten paraffin basin, then moves on to the "striking compound" to form the ignition head of the match.

When the splints are thoroughly impregnated, the cylinder passes over the metal hot-plate. By the time it reaches the end of the table the splints are entirely dry and ready for packing.

Here metal fingers again snap into action, grasping the matches in huge handfuls and piling them in boxes. As the boxes are filled, a conveyer moves them to the packing room where they are crated for market. In the shipping room the match comes in contact with human hands for the first time. All previous operations from the moment the match splints entered the hopper were entirely automatic.

The speed of the continuous match-making machine may be set according to factory requirements from 175 to 475 revolutions a minute. A single revolution of the cylinder completely finishes an operation.

Above—Impregnating splints with boric acid solution to prevent afterglow when match is struck

Pouring liquid chemicals into tipping machine. Note bristle-like matches on belt being carried through three compositions in which match heads are dipped to form the combustible crowns for striking.

While a box of 500 matches sells for only a nickel, the cost of match-making materials used is really negligible. As a matter of fact, four persons operating one machine can, in eight hours, turn out matches with a retail value of more than $10,000!

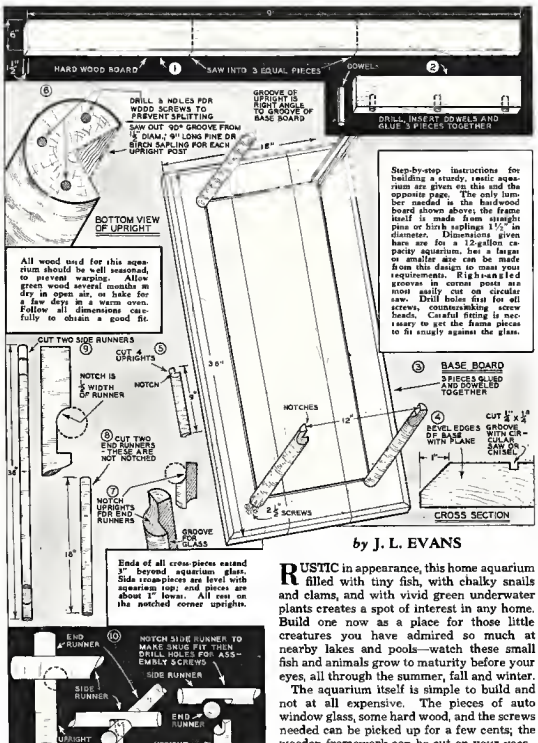
The manufacture of the match box, an indispensable part of the match industry, likewise demands low cost production. A roll of strawboard paper, cut to the proper width and lined with pink or white paper, is placed in an ingenious machine. The strawboard paper is scored or marked at the four corners, then glued, folded into an endless tube and passed through a press where it is imprinted on three sides.

Another machine coats sand or ground glass for a striking surface on the fourth side. One of these machines can turn out 24,000 finished boxes hourly.

Book matches are manufactured by an entirely different type of machinery. Wood or tough fiber is cut into "combs," dipped into match-making compound, dried, packed and marketed in the more convenient pocket form.

More than 11 per cent of the matches used by Americans are brought into the country from Japan, France, Sweden and Norway.

RUSTIC DESIGN Features This HOME AQUARIUM


HARD WOOD BOARD
SAW INTO 3 EQUAL PIECES
DOWEL
GROOVE OF UPRIGHT IS AT RIGHT ANGLE TO GROOVE OF BASE BOARD
DRILL, INSERT DOWELS AND GLUE 3 PIECES TOGETHER
DRILL 3 HOLES FOR WOOD SCREWS TO PREVENT SPLITTING
SAW OUT 90° GROOVE FROM ¼" DIAM., 9" LONG PINE OR SPRUCE SAPLING FOR EACH UPRIGHT POST
BOTTOM VIEW OF UPRIGHT
12"
All wood used for this aquarium should be well seasoned, to prevent warping. Allow green wood several months to dry in open air, or bake for a few days in a warm oven. Follow all dimensions carefully to obtain a good fit.
Step-by-step instructions for building a sturdy, rustic aquarium are given on this and the opposite page. The only lumber needed is the hardwood board shown above; the frame itself is made from straight pine or birch saplings 1½" in diameter. Dimensions given here are for a 12-gallon capacity aquarium, but a larger or smaller size can be made from this design to meet your requirements. Rip-sawed grooves in corner posts are most easily cut on circular saw. Drill holes first for oil screws, countersinking screw heads. Careful fitting is necessary to get the frame pieces to fit snugly against the glass.
CUT TWO SIDE RUNNERS
CUT 4 UPRIGHTS
NOTCH IS ½ WIDTH OF RUNNER
NOTCH
36"
9"
CUT TWO END RUNNERS - THESE ARE NOT NOTCHED
NOTCH UPRIGHTS FOR END RUNNERS
16"
NOTCHES
12"
3 BASE BOARD
3 PIECES GLUED AND DOWELED TOGETHER
4 BEVEL EDGES OF BASE WITH PLANE
CUT ¼" x ⅛" GROOVE WITH CIRCULAR SAW & CHISEL
1"
2½" SCREWS
CROSS SECTION
GROOVE FOR GLASS
Ends of all cross-pieces extend 3" beyond aquarium glass. Side cross-pieces are level with aquarium top; end pieces are about 1" lower. All rest on the notched corner uprights.
10 END RUNNER
NOTCH SIDE RUNNER TO MAKE SNUG FIT THEN DRILL HOLES FOR ASSEMBLY SCREWS
SIDE RUNNER
SIDE RUNNER
END RUNNER
UPRIGHT
END RUNNER
UPRIGHT

by J. L. EVANS

RUSTIC in appearance, this home aquarium filled with tiny fish, with chalky snails and clams, and with vivid green underwater plants creates a spot of interest in any home. Build one now as a place for those little creatures you have admired so much at nearby lakes and pools—watch these small fish and animals grow to maturity before your eyes, all through the summer, fall and winter.

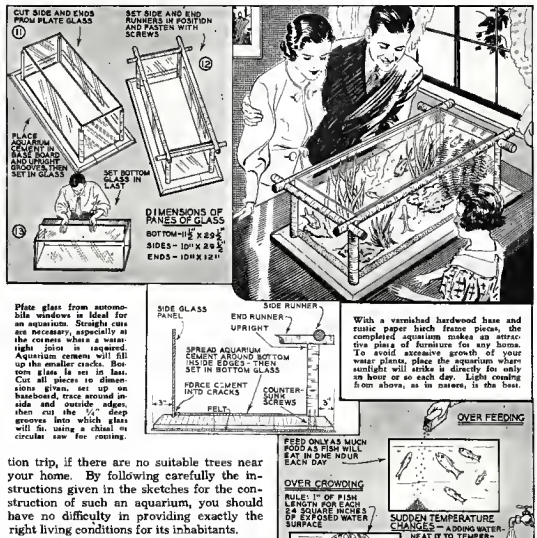
The aquarium itself is simple to build and not at all expensive. The pieces of auto window glass, some hard wood, and the screws needed can be picked up for a few cents; the wooden framework can be cut on your vacation trip, if there are no suitable trees near your home. By following carefully the instructions given in the sketches for the construction of such an aquarium, you should have no difficulty in providing exactly the right living conditions for its inhabitants.

Aquarium cement is used to make watertight joints between the panes of glass and between the glass and the baseboard. This may be obtained at any pet shop, or may be made up at home.

Spread cement into the grooves in the baseboard, using only enough to fill the cracks when the glass is set in. Now assemble the aquarium piece by piece, applying cement to each joint and to the insides of the corner posts. Block up the glass from the inside to keep it in position until the cement hardens.

You still have one pane of glass left—this is to go on the bottom of the aquarium. and

[*Continued on page* 122]


CUT SIDE AND ENDS FROM PLATE GLASS
11
SET SIDE AND END RUNNERS IN POSITION AND FASTEN WITH SCREWS
12
PLACE AQUARIUM CEMENT IN BASE BOARD AND UPRIGHT GROOVES, THEN SET IN GLASS
SET BOTTOM GLASS IN LAST
13
DIMENSIONS OF PANES OF GLASS
BOTTOM - 11½" X 29½"
SIDES - 10½" X 29½"
ENDS - 10½" X 12"
Plate glass from automobile windows is ideal for an aquarium. Straight cuts are necessary, especially at the corners where a watertight joint is required. Aquarium cement will fill up the smaller cracks. Bottom glass is set in last. Cut all pieces to dimensions given, set up on baseboard, trace around inside and outside edges, then cut the ½" deep grooves into which glass will fit, using a chisel or circular saw for routing.
SIDE GLASS PANEL
END RUNNER
UPRIGHT
SIDE RUNNER
SPREAD AQUARIUM CEMENT AROUND BOTTOM INSIDE EDGES - THEN SET IN BOTTOM GLASS
FORCE CEMENT INTO CRACKS
COUNTERSUNK SCREWS
3"
FELT
With a varnished hardwood base and rustic paper birch frame pieces, the completed aquarium makes an attractive piece of furniture for any home. To avoid excessive growth of your water plants, place the aquarium where sunlight will strike it directly for only an hour or so each day. Light coming from above, as in nature, is the best.
OVER FEEDING
FEED ONLY AS MUCH FOOD AS FISH WILL EAT IN ONE HOUR EACH DAY
OVER CROWDING
RULE: 1" OF FISH LENGTH FOR EACH 24 SQUARE INCHES OF EXPOSED WATER SURFACE
SUDDEN TEMPERATURE CHANGES
ADDING WATER
HEAT IT TO TEMPERATURE OF AQUARIUM
70°
RATES OF THE FISHES

MAKING AQUARIUM CEMENT

Mix together 1 part white lead, 1 part plaster of Paris, 1 part litharge, and ½ part powdered resin, then add linseed oil and clear varnish slowly, carefully working in each small portion of oil. Add just enough oil, after the lumpy stage is reached, to make a stiff, smooth, and thick paste. This formula is recommended for its strength, permanence, and harmlessness to the aquarium inhabitants.

EX LIBRIS
Anonymous
Malefactor
MVSIQVE AND SWEET POETRIE AGREE
AS THEY MVST NEEDES
DATE